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(54) **AUTOMOTIVE COMMUNICATION SYSTEM**

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(56) **References Cited**

**U.S. PATENT DOCUMENTS**

1,096,452 A 5/1914 Perrin  
1,563,258 A 11/1925 Cunningham

(Continued)

**FOREIGN PATENT DOCUMENTS**

AU A-40317/95 2/1995  
CN 1189224 7/1998

(Continued)

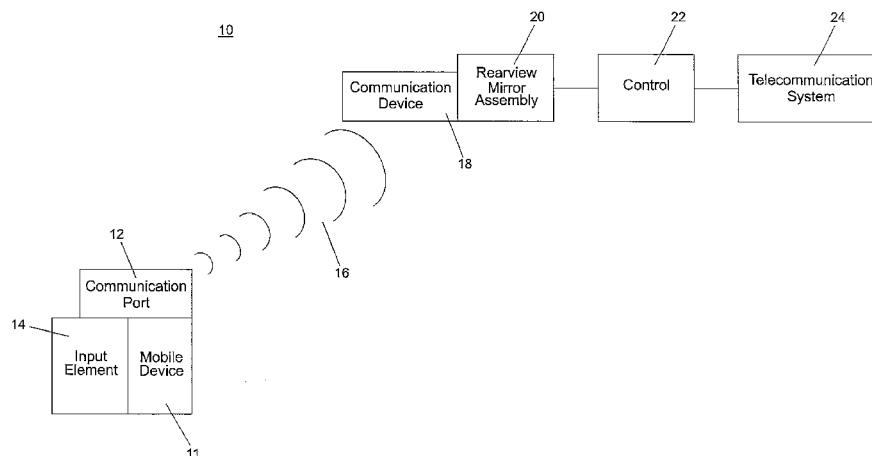
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(57) **ABSTRACT**

An automotive communication system for a vehicle includes a global positioning system operable to determine a geographical location and a multi-pixel reconfigurable display device disposed at an interior portion of the vehicle. Data is wirelessly communicated to and is received by electronic circuitry of the vehicle and the data is at least in part customized to the geographic location of the vehicle as determined by the global positioning system. Information that is derived at least in part from the data is displayed by the display device and is viewable by a driver of the vehicle. A user input for the wireless communication is operable within the interior cabin of the vehicle. The automotive communication system includes voice input. The data is wirelessly communicated to the vehicle from a data provider located external of and remote from the vehicle.

**20 Claims, 3 Drawing Sheets**



## Related U.S. Application Data

(56)

## References Cited

## U.S. PATENT DOCUMENTS

- continuation of application No. 12/551,849, filed on Sep. 1, 2009, now Pat. No. 7,916,043, which is a continuation of application No. 11/935,795, filed on Nov. 6, 2007, now Pat. No. 7,583,204, which is a continuation of application No. 11/053,436, filed on Feb. 8, 2005, now Pat. No. 7,382,289, which is a continuation of application No. 10/777,812, filed on Feb. 12, 2004, now Pat. No. 6,909,361, which is a continuation of application No. 09/839,678, filed on Apr. 20, 2001, now Pat. No. 6,693,517, said application No. 10/777,812 is a continuation-in-part of application No. 10/365,794, filed on Feb. 13, 2003, now Pat. No. 6,832,719, which is a continuation of application No. 09/687,778, filed on Oct. 13, 2000, now Pat. No. 6,547,133, which is a continuation of application No. 09/057,428, filed on Apr. 8, 1998, now Pat. No. 6,158,655, said application No. 10/777,812 is a continuation-in-part of application No. 10/755,627, filed on Jan. 12, 2004, now Pat. No. 7,158,881, which is a continuation of application No. 10/287,178, filed on Nov. 4, 2002, now Pat. No. 6,678,614, which is a continuation of application No. 09/799,414, filed on Mar. 5, 2001, now Pat. No. 6,477,464, said application No. 13/050,133 is a continuation-in-part of application No. 12/536,930, filed on Aug. 6, 2009, now Pat. No. 8,044,776, which is a continuation of application No. 12/052,341, filed on Mar. 20, 2008, now Pat. No. 7,579,940, which is a continuation of application No. 11/625,374, filed on Jan. 22, 2007, now Pat. No. 7,579,939, which is a continuation of application No. 10/755,915, filed on Jan. 13, 2004, now Pat. No. 7,446,650, which is a continuation of application No. 09/793,002, filed on Feb. 26, 2001, now Pat. No. 6,690,268.
- (60) Provisional application No. 60/199,676, filed on Apr. 21, 2000, provisional application No. 60/187,960, filed on Mar. 9, 2000, provisional application No. 60/263,680, filed on Jan. 23, 2001, provisional application No. 60/243,986, filed on Oct. 27, 2000, provisional application No. 60/238,483, filed on Oct. 6, 2000, provisional application No. 60/237,077, filed on Sep. 30, 2000, provisional application No. 60/234,412, filed on Sep. 21, 2000, provisional application No. 60/218,336, filed on Jul. 14, 2000, provisional application No. 60/186,520, filed on Mar. 2, 2000.
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- |           |   |         |                    |
|-----------|---|---------|--------------------|
| 2,069,368 | A | 2/1937  | Horinstein         |
| 2,166,303 | A | 7/1939  | Hodny et al.       |
| 2,263,382 | A | 11/1941 | Gotzinger          |
| 2,414,223 | A | 1/1947  | DeVirgilis         |
| 2,457,348 | A | 12/1948 | Chambers           |
| 2,561,582 | A | 7/1951  | Marbel             |
| 2,580,014 | A | 12/1951 | Gazda              |
| 3,004,473 | A | 10/1961 | Arthur et al.      |
| 3,075,430 | A | 1/1963  | Woodward et al.    |
| 3,141,393 | A | 7/1964  | Platt              |
| 3,152,216 | A | 10/1964 | Woodward           |
| 3,162,008 | A | 12/1964 | Berger et al.      |
| 3,185,020 | A | 5/1965  | Thelen             |
| 3,266,016 | A | 8/1966  | Maruyama et al.    |
| 3,280,701 | A | 10/1966 | Donnelly et al.    |
| 3,432,225 | A | 3/1969  | Rock               |
| 3,451,741 | A | 6/1969  | Manos              |
| 3,453,038 | A | 7/1969  | Kissa et al.       |
| 3,467,465 | A | 9/1969  | Van Noord          |
| 3,473,867 | A | 10/1969 | Byrnes             |
| 3,480,781 | A | 11/1969 | Mandalakas         |
| 3,499,112 | A | 3/1970  | Heilmeyer et al.   |
| 3,499,702 | A | 3/1970  | Goldmacher et al.  |
| 3,521,941 | A | 7/1970  | Deb et al.         |
| 3,543,018 | A | 11/1970 | Barcus et al.      |
| 3,557,265 | A | 1/1971  | Chisholm et al.    |
| 3,565,985 | A | 2/1971  | Schrenk et al.     |
| 3,612,654 | A | 10/1971 | Klein              |
| 3,614,210 | A | 10/1971 | Caplan             |
| 3,628,851 | A | 12/1971 | Robertson          |
| 3,648,229 | A | 3/1972  | Burrows et al.     |
| 3,676,668 | A | 7/1972  | Collins et al.     |
| 3,680,951 | A | 8/1972  | Jordan et al.      |
| 3,689,695 | A | 9/1972  | Rosenfield et al.  |
| 3,711,176 | A | 1/1973  | Alfrey, Jr. et al. |
| 3,712,710 | A | 1/1973  | Castellion et al.  |
| 3,748,017 | A | 7/1973  | Yamamura et al.    |
| 3,781,090 | A | 12/1973 | Sumita             |
| 3,806,229 | A | 4/1974  | Schoot et al.      |
| 3,807,832 | A | 4/1974  | Castellion         |
| 3,807,833 | A | 4/1974  | Graham et al.      |
| 3,821,590 | A | 6/1974  | Kosman et al.      |
| 3,837,129 | A | 9/1974  | Losell             |
| 3,841,732 | A | 10/1974 | Marks              |
| 3,860,847 | A | 1/1975  | Carley             |
| 3,862,798 | A | 1/1975  | Hopkins            |
| 3,870,404 | A | 3/1975  | Wilson et al.      |
| 3,876,287 | A | 4/1975  | Sprokel            |
| 3,932,024 | A | 1/1976  | Yaguchi et al.     |
| 3,940,822 | A | 3/1976  | Emerick et al.     |
| 3,956,017 | A | 5/1976  | Shigemasa          |
| 3,978,190 | A | 8/1976  | Kurz, Jr. et al.   |
| 3,985,424 | A | 10/1976 | Steinacher         |
| 4,006,546 | A | 2/1977  | Anderson et al.    |
| 4,035,681 | A | 7/1977  | Savage             |
| 4,040,727 | A | 8/1977  | Ketchpel           |
| 4,052,712 | A | 10/1977 | Ohama et al.       |
| 4,075,468 | A | 2/1978  | Marcus             |
| 4,088,400 | A | 5/1978  | Assouline et al.   |
| 4,093,364 | A | 6/1978  | Miller             |
| 4,097,131 | A | 6/1978  | Nishiyama          |
| 4,109,235 | A | 8/1978  | Bouthors           |
| 4,139,234 | A | 2/1979  | Morgan             |
| 4,159,866 | A | 7/1979  | Wunsch et al.      |
| 4,161,653 | A | 7/1979  | Bedini et al.      |
| 4,171,875 | A | 10/1979 | Taylor et al.      |
| 4,174,152 | A | 11/1979 | Gilia et al.       |
| 4,200,361 | A | 4/1980  | Malvano et al.     |
| 4,202,607 | A | 5/1980  | Washizuka et al.   |
| 4,211,955 | A | 7/1980  | Ray                |
| 4,214,266 | A | 7/1980  | Myers              |
| 4,219,760 | A | 8/1980  | Ferro              |
| 4,221,955 | A | 9/1980  | Joslyn             |
| 4,228,490 | A | 10/1980 | Thillays           |
| 4,247,870 | A | 1/1981  | Gabel et al.       |

(56)

## References Cited

## U.S. PATENT DOCUMENTS

4,257,703	A	3/1981	Goodrich	4,729,076	A	3/1988	Masami et al.
4,274,078	A	6/1981	Isobe et al.	4,731,669	A	3/1988	Hayashi et al.
4,277,804	A	7/1981	Robison	4,733,335	A	3/1988	Serizawa et al.
4,281,899	A	8/1981	Oskam	4,733,336	A	3/1988	Skogler et al.
4,288,814	A	9/1981	Talley et al.	4,740,838	A	4/1988	Mase et al.
4,297,401	A	10/1981	Chern et al.	4,758,040	A	7/1988	Kingsley et al.
RE30,835	E	12/1981	Giglia	4,761,061	A	8/1988	Nishiyama et al.
4,306,768	A	12/1981	Egging	4,773,740	A	9/1988	Kawakami et al.
4,310,851	A	1/1982	Pierrat	4,780,752	A	10/1988	Angerstein et al.
4,331,382	A	5/1982	Graff	4,781,436	A	11/1988	Armbruster
4,338,000	A	7/1982	Kamimori et al.	4,789,774	A	12/1988	Koch et al.
4,377,613	A	3/1983	Gordon	4,789,904	A	12/1988	Peterson
4,398,805	A	8/1983	Cole	4,793,690	A	12/1988	Gahan et al.
4,419,386	A	12/1983	Gordon	4,793,695	A	12/1988	Wada et al.
4,420,238	A	12/1983	Felix	4,794,261	A	12/1988	Rosen
4,425,717	A	1/1984	Marcus	D299,491	S	1/1989	Masuda
4,435,042	A	3/1984	Wood et al.	4,799,768	A	1/1989	Gahan
4,435,048	A	3/1984	Kamimori et al.	4,803,599	A	2/1989	Trine et al.
4,436,371	A	3/1984	Wood et al.	4,807,096	A	2/1989	Skogler et al.
4,438,348	A	3/1984	Casper et al.	4,820,933	A	4/1989	Hong et al.
4,443,057	A	4/1984	Bauer et al.	4,825,232	A	4/1989	Howdle
4,446,171	A	5/1984	Thomas	4,826,289	A	5/1989	Vandenbrink et al.
4,447,808	A	5/1984	Marcus	4,827,086	A	5/1989	Rockwell
4,465,339	A	8/1984	Baucke et al.	4,837,551	A	6/1989	Iino
4,473,695	A	9/1984	Wrighton et al.	4,842,378	A	6/1989	Flasck et al.
4,490,227	A	12/1984	Bitter	4,845,402	A	7/1989	Smith
4,491,390	A	1/1985	Tong-Shen	4,847,772	A	7/1989	Michalopoulos et al.
4,499,451	A	2/1985	Suzuki et al.	4,855,161	A	8/1989	Moser et al.
4,521,079	A	6/1985	Leenhouts et al.	4,855,550	A	8/1989	Schultz, Jr.
4,524,941	A	6/1985	Wood et al.	4,859,813	A	8/1989	Rockwell
4,538,063	A	8/1985	Bulat	4,859,867	A	8/1989	Larson et al.
4,546,551	A	10/1985	Franks	4,860,171	A	8/1989	Kojima
4,555,694	A	11/1985	Yanagishima et al.	4,862,594	A	9/1989	Schierbeek et al.
4,561,625	A	12/1985	Weaver	4,871,917	A	10/1989	O'Farrell et al.
4,572,619	A	2/1986	Reininger et al.	4,872,051	A	10/1989	Dye
4,580,196	A	4/1986	Task	4,882,466	A	11/1989	Friel
4,580,875	A	4/1986	Bechtel et al.	4,882,565	A	11/1989	Gallmeyer
4,581,827	A	4/1986	Higashi	4,883,349	A	11/1989	Mittelhäuser
4,588,267	A	5/1986	Pastore	4,884,135	A	11/1989	Schiffman
4,603,946	A	8/1986	Kato et al.	4,886,960	A	12/1989	Molyneux et al.
4,623,222	A	11/1986	Itoh et al.	4,889,412	A	12/1989	Clerc et al.
4,625,210	A	11/1986	Sagl	4,891,828	A	1/1990	Kawazoe
4,626,850	A	12/1986	Chey	4,892,345	A	1/1990	Rachael, III
4,630,040	A	12/1986	Haertling	4,902,103	A	2/1990	Miyake et al.
4,630,109	A	12/1986	Barton	4,902,108	A	2/1990	Byker
4,630,904	A	12/1986	Pastore	4,906,085	A	3/1990	Sugihara et al.
4,634,835	A	1/1987	Suzuki	4,909,606	A	3/1990	Wada et al.
4,635,033	A	1/1987	Inukai et al.	4,910,591	A	3/1990	Petrossian et al.
4,636,782	A	1/1987	Nakamura et al.	4,916,374	A	4/1990	Schierbeek et al.
4,638,287	A	1/1987	Umebayashi et al.	4,917,477	A	4/1990	Bechtel et al.
4,646,210	A	2/1987	Skogler et al.	4,926,170	A	5/1990	Beggs et al.
4,652,090	A	3/1987	Uchikawa et al.	4,930,742	A	6/1990	Schofield et al.
4,655,549	A	4/1987	Suzuki et al.	4,933,814	A	6/1990	Sanai
4,664,479	A	5/1987	Hiroshi	4,935,665	A	6/1990	Murata
4,665,311	A	5/1987	Cole	4,936,533	A	6/1990	Adams et al.
4,665,430	A	5/1987	Hiroyasu	4,937,796	A	6/1990	Tendler
4,669,827	A	6/1987	Fukada et al.	4,937,945	A	7/1990	Schofield et al.
4,671,615	A	6/1987	Fukada et al.	4,943,796	A	7/1990	Lee
4,671,619	A	6/1987	Kamimori et al.	4,948,242	A	8/1990	Desmond et al.
4,678,281	A	7/1987	Bauer	4,953,305	A	9/1990	Van Lente et al.
4,679,906	A	7/1987	Brandenburg	4,956,591	A	9/1990	Schierbeek et al.
4,682,083	A	7/1987	Alley	4,957,349	A	9/1990	Clerc et al.
4,692,798	A	9/1987	Seko et al.	4,959,247	A	9/1990	Moser et al.
4,694,295	A	9/1987	Miller et al.	4,959,865	A	9/1990	Stettiner et al.
4,697,883	A	10/1987	Suzuki et al.	4,970,653	A	11/1990	Kenue
4,701,022	A	10/1987	Jacob	4,973,844	A	11/1990	O'Farrell et al.
4,702,566	A	10/1987	Tukude	4,974,122	A	11/1990	Shaw
4,704,740	A	11/1987	McKee et al.	4,978,196	A	12/1990	Suzuki et al.
4,711,544	A	12/1987	Iino et al.	4,983,951	A	1/1991	Igarashi et al.
4,712,879	A	12/1987	Lynam et al.	4,985,809	A	1/1991	Matsui et al.
4,713,685	A	12/1987	Nishimura et al.	4,987,357	A	1/1991	Masaki
RE32,576	E	1/1988	Pastore	4,989,956	A	2/1991	Wu et al.
4,718,756	A	1/1988	Lancaster	4,996,083	A	2/1991	Moser et al.
4,721,364	A	1/1988	Itoh et al.	5,001,386	A	3/1991	Sullivan et al.
4,729,068	A	3/1988	Ohe	5,001,558	A	3/1991	Burley et al.
				5,005,213	A	4/1991	Hanson et al.
				5,006,971	A	4/1991	Jenkins
				5,012,077	A	4/1991	Takano
				5,014,167	A	5/1991	Roberts

(56)

## References Cited

## U.S. PATENT DOCUMENTS

5,016,988 A	5/1991	Imura	5,239,406 A	8/1993	Lynam
5,016,996 A	5/1991	Ueno	5,243,417 A	9/1993	Pollard
5,017,903 A	5/1991	Krippelz, Sr.	5,245,422 A	9/1993	Borcherts et al.
5,018,839 A	5/1991	Yamamoto et al.	5,252,354 A	10/1993	Cronin et al.
5,027,200 A	6/1991	Petrossian et al.	5,253,109 A	10/1993	O'Farrell et al.
5,037,182 A	8/1991	Groves et al.	5,255,442 A	10/1993	Schierbeek et al.
5,038,255 A	8/1991	Nishihashi et al.	5,260,626 A	11/1993	Takase et al.
5,052,163 A	10/1991	Czekala	5,277,986 A	1/1994	Cronin et al.
5,056,899 A	10/1991	Warszawski	5,280,555 A	1/1994	Ainsburg
5,057,974 A	10/1991	Mizobe	5,285,060 A	2/1994	Larson et al.
5,058,851 A	10/1991	Lawlor et al.	5,289,321 A	2/1994	Secor
5,059,015 A	10/1991	Tran	5,296,924 A	3/1994	de Saint Blancard et al.
5,066,108 A	11/1991	McDonald	5,303,075 A	4/1994	Wada et al.
5,066,112 A	11/1991	Lynam et al.	5,303,205 A	4/1994	Gauthier et al.
5,069,535 A	12/1991	Bauke et al.	5,304,980 A	4/1994	Maekawa
5,070,323 A	12/1991	Iino et al.	5,305,012 A	4/1994	Faris
5,072,380 A	12/1991	Randelman et al.	5,307,136 A	4/1994	Saneyoshi
5,073,012 A	12/1991	Lynam	5,310,999 A	5/1994	Claus et al.
5,076,673 A	12/1991	Lynam et al.	5,313,335 A	5/1994	Gray et al.
5,076,674 A	12/1991	Lynam	5,325,096 A	6/1994	Pakett
5,078,480 A	1/1992	Warszawski	5,325,386 A	6/1994	Jewell et al.
5,096,287 A	3/1992	Kakinami et al.	5,327,288 A	7/1994	Wellington et al.
5,100,095 A	3/1992	Haan et al.	5,330,149 A	7/1994	Haan et al.
5,101,139 A	3/1992	Lechter	5,331,312 A	7/1994	Kudoh
5,105,127 A	4/1992	Lavaud et al.	5,331,358 A	7/1994	Schurle et al.
5,115,346 A	5/1992	Lynam	5,339,075 A	8/1994	Abst et al.
5,119,220 A	6/1992	Narita et al.	5,339,529 A	8/1994	Lindberg
5,121,200 A	6/1992	Choi	5,341,437 A	8/1994	Nakayama
5,122,619 A	6/1992	Dlubak	D351,370 S	10/1994	Lawlor et al.
5,123,077 A	6/1992	Endo et al.	5,354,965 A	10/1994	Lee
5,124,845 A	6/1992	Shimojo	5,355,118 A	10/1994	Fukuhara
5,124,890 A	6/1992	Choi et al.	5,355,245 A	10/1994	Lynam
5,128,799 A	7/1992	Byker	5,355,284 A	10/1994	Roberts
5,130,898 A	7/1992	Akahane	5,361,190 A	11/1994	Roberts et al.
5,131,154 A	7/1992	Schierbeek et al.	5,363,294 A	11/1994	Yamamoto et al.
5,134,507 A	7/1992	Ishii	5,371,659 A	12/1994	Pastrick et al.
5,134,549 A	7/1992	Yokoyama	5,373,482 A	12/1994	Gauthier
5,135,298 A	8/1992	Feltman	5,379,146 A	1/1995	Defendini
5,136,483 A	8/1992	Schöniger et al.	5,386,285 A	1/1995	Asayama
5,140,455 A	8/1992	Varaprasad et al.	5,386,306 A	1/1995	Gunjima et al.
5,140,465 A	8/1992	Yasui et al.	5,398,134 A	3/1995	Ikegaya
5,142,407 A	8/1992	Varaprasad et al.	5,400,158 A	3/1995	Ohnishi et al.
5,145,609 A	9/1992	Varaprasad et al.	5,402,103 A	3/1995	Tashiro
5,148,306 A	9/1992	Yamada et al.	5,406,395 A	4/1995	Wilson et al.
5,150,232 A	9/1992	Gunkima et al.	5,406,414 A	4/1995	O'Farrell et al.
5,151,816 A	9/1992	Varaprasad et al.	5,408,353 A	4/1995	Nichols et al.
5,151,824 A	9/1992	O'Farrell	5,408,357 A	4/1995	Beukema
5,154,617 A	10/1992	Suman et al.	5,410,346 A	4/1995	Saneyoshi et al.
5,158,638 A	10/1992	Osanami et al.	5,414,439 A	5/1995	Groves et al.
5,160,200 A	11/1992	Cheselske	5,414,461 A	5/1995	Kishi et al.
5,160,201 A	11/1992	Wrobel	5,416,313 A	5/1995	Larson et al.
5,166,815 A	11/1992	Elderfield	5,416,478 A	5/1995	Morinaga
5,168,378 A	12/1992	Black et al.	5,418,610 A	5/1995	Fischer
5,173,881 A	12/1992	Sindle	5,422,756 A	6/1995	Weber
5,177,031 A	1/1993	Buchmann et al.	5,424,726 A	6/1995	Beymer
5,178,448 A	1/1993	Adams et al.	5,424,865 A	6/1995	Lynam
5,179,471 A	1/1993	Caskey et al.	5,424,952 A	6/1995	Asayama
5,183,099 A	2/1993	Bechu	5,426,524 A	6/1995	Wada et al.
5,184,956 A	2/1993	Langlarais et al.	5,426,723 A	6/1995	Horsley
5,189,537 A	2/1993	O'Farrell	5,430,431 A	7/1995	Nelson
5,193,029 A	3/1993	Schofield et al.	5,432,496 A	7/1995	Lin
5,197,562 A	3/1993	Kakinama et al.	5,432,626 A	7/1995	Sasuga et al.
5,202,950 A	4/1993	Arego et al.	5,436,741 A	7/1995	Crandall
5,207,492 A	5/1993	Roberts	5,437,931 A	8/1995	Tsai et al.
5,210,967 A	5/1993	Brown	5,439,305 A	8/1995	Santo
5,212,819 A	5/1993	Wada	5,444,478 A	8/1995	Lelong et al.
5,214,408 A	5/1993	Asayama	5,446,576 A	8/1995	Lynam et al.
5,217,794 A	6/1993	Schrenk	5,455,716 A	10/1995	Suman et al.
5,223,814 A	6/1993	Suman	5,461,361 A	10/1995	Moore
5,223,844 A	6/1993	Mansell et al.	D363,920 S	11/1995	Roberts et al.
5,229,975 A	7/1993	Truesdell et al.	5,469,187 A	11/1995	Yaniv
5,230,400 A	7/1993	Kakinami et al.	5,469,298 A	11/1995	Suman et al.
5,233,461 A	8/1993	Dornan et al.	5,473,702 A	12/1995	Yoshida et al.
5,235,316 A	8/1993	Qualizza	5,475,366 A	12/1995	Van Lente et al.
5,239,405 A	8/1993	Varaprasad et al.	5,475,494 A	12/1995	Nishida et al.
			5,481,409 A	1/1996	Roberts
			5,483,453 A	1/1996	Uemura et al.
			5,485,161 A	1/1996	Vaughn
			5,485,378 A	1/1996	Franke et al.

(56)

## References Cited

## U.S. PATENT DOCUMENTS

5,485,520	A	1/1996	Chaum et al.	5,646,614	A	7/1997	Abersfelder et al.
5,487,522	A	1/1996	Hook	5,649,756	A	7/1997	Adams et al.
5,488,496	A	1/1996	Pine	5,649,758	A	7/1997	Dion
5,497,305	A	3/1996	Pastrick et al.	5,650,765	A	7/1997	Park
5,497,306	A	3/1996	Pastrick	5,650,929	A	7/1997	Potter et al.
5,500,760	A	3/1996	Varaprasad et al.	5,661,455	A	8/1997	Van Lente et al.
5,506,701	A	4/1996	Ichikawa	5,661,651	A	8/1997	Geschke et al.
5,509,606	A	4/1996	Breithaupt et al.	5,661,804	A	8/1997	Dykema et al.
5,510,983	A	4/1996	Iino	5,662,375	A	9/1997	Adams et al.
5,515,448	A	5/1996	Nishitani	5,663,548	A	9/1997	Hayashi et al.
5,517,853	A	5/1996	Chamussy	5,666,157	A	9/1997	Aviv
5,519,621	A	5/1996	Wortham	5,667,289	A	9/1997	Akahane et al.
5,521,744	A	5/1996	Mazurek	5,668,663	A	9/1997	Varaprasad et al.
5,521,760	A	5/1996	De Young et al.	5,668,675	A	9/1997	Fredricks
5,523,811	A	6/1996	Wada et al.	5,669,698	A	9/1997	Veldman et al.
5,523,877	A	6/1996	Lynam	5,669,699	A	9/1997	Pastrick et al.
5,525,264	A	6/1996	Cronin et al.	5,669,704	A	9/1997	Pastrick
5,525,977	A	6/1996	Suman	5,669,705	A	9/1997	Pastrick et al.
5,528,422	A	6/1996	Roberts	5,670,935	A	9/1997	Schofield et al.
5,528,474	A	6/1996	Roney et al.	5,671,996	A	9/1997	Bos et al.
5,529,138	A	6/1996	Shaw et al.	5,673,994	A	10/1997	Fant, Jr. et al.
5,530,240	A	6/1996	Larson et al.	5,673,999	A	10/1997	Koenck
5,530,420	A	6/1996	Tsuchiya et al.	5,677,598	A	10/1997	De Hair et al.
5,530,421	A	6/1996	Marshall et al.	5,679,283	A	10/1997	Tonar et al.
5,535,056	A	7/1996	Caskey et al.	5,680,123	A	10/1997	Lee
5,535,144	A	7/1996	Kise	5,680,245	A	10/1997	Lynam
5,539,397	A	7/1996	Asanuma et al.	5,680,263	A	10/1997	Zimmermann et al.
5,541,590	A	7/1996	Nishio	5,686,975	A	11/1997	Lipton
5,550,677	A	8/1996	Schofield et al.	5,686,979	A	11/1997	Weber et al.
5,555,172	A	9/1996	Potter	5,689,241	A	11/1997	Clarke, Sr. et al.
5,561,333	A	10/1996	Darius	5,689,370	A	11/1997	Tonar et al.
5,566,224	A	10/1996	ul Azam et al.	5,691,848	A	11/1997	Van Lente et al.
5,567,360	A	10/1996	Varaprasad et al.	5,692,819	A	12/1997	Mitsutake et al.
5,568,316	A	10/1996	Schrenck et al.	5,694,474	A	12/1997	Ngo et al.
5,570,127	A	10/1996	Schmidt	5,696,529	A	12/1997	Evanicky et al.
5,572,354	A	11/1996	Desmond et al.	5,696,567	A	12/1997	Wada et al.
5,574,426	A	11/1996	Shisgal et al.	5,699,044	A	12/1997	Van Lente et al.
5,574,443	A	11/1996	Hsieh	5,699,188	A	12/1997	Gilbert et al.
5,575,552	A	11/1996	Faloon et al.	5,703,568	A	12/1997	Hegyi
5,576,687	A	11/1996	Blank et al.	5,708,410	A	1/1998	Blank et al.
5,576,854	A	11/1996	Schmidt et al.	5,708,415	A	1/1998	Van Lente et al.
5,576,975	A	11/1996	Sasaki et al.	5,708,857	A	1/1998	Ishibashi
5,578,404	A	11/1996	Kliem	5,710,702	A	1/1998	Hayashi et al.
5,587,236	A	12/1996	Agrawal et al.	5,715,093	A	2/1998	Schierbeek et al.
5,587,699	A	12/1996	Faloon et al.	5,724,187	A	3/1998	Varaprasad et al.
5,590,038	A	12/1996	Pitroda	5,724,316	A	3/1998	Brunts
5,593,221	A	1/1997	Evanicky et al.	5,729,194	A	3/1998	Spears et al.
5,594,222	A	1/1997	Caldwell	5,737,226	A	4/1998	Olson et al.
5,594,560	A	1/1997	Jelley et al.	5,741,966	A	4/1998	Handfield et al.
5,594,615	A	1/1997	Spijkerman et al.	5,744,227	A	4/1998	Bright et al.
5,602,542	A	2/1997	Widmann et al.	5,745,050	A	4/1998	Nakagawa
5,602,670	A	2/1997	Keegan	5,745,266	A	4/1998	Smith
5,603,104	A	2/1997	Phelps, III et al.	5,748,172	A	5/1998	Song et al.
5,608,550	A	3/1997	Epstein et al.	5,748,287	A	5/1998	Takahashi et al.
5,609,652	A	3/1997	Yamada et al.	5,751,211	A	5/1998	Shirai et al.
5,610,380	A	3/1997	Nicolaisen	5,751,246	A	5/1998	Hertel
5,610,756	A	3/1997	Lynam et al.	5,751,390	A	5/1998	Crawford et al.
5,611,966	A	3/1997	Varaprasad et al.	5,751,489	A	5/1998	Caskey et al.
5,614,885	A	3/1997	Van Lente et al.	5,754,099	A	5/1998	Nishimura et al.
5,615,023	A	3/1997	Yang	5,754,665	A	5/1998	Hosoi
5,615,857	A	4/1997	Hook	D394,833	S	6/1998	Muth
5,617,085	A	4/1997	Tsutsumi et al.	5,760,242	A	6/1998	Igrashi et al.
5,619,374	A	4/1997	Roberts	5,760,828	A	6/1998	Cortes
5,619,375	A	4/1997	Roberts	5,760,931	A	6/1998	Saburi et al.
5,621,571	A	4/1997	Bantli et al.	5,760,962	A	6/1998	Schofield et al.
5,626,800	A	5/1997	Williams et al.	5,761,094	A	6/1998	Olson et al.
5,631,089	A	5/1997	Center, Jr. et al.	5,762,823	A	6/1998	Hikmet
5,631,638	A	5/1997	Kaspar et al.	5,764,139	A	6/1998	Nojima et al.
5,631,639	A	5/1997	Hibino et al.	5,765,940	A	6/1998	Levy et al.
5,632,092	A	5/1997	Blank et al.	5,767,793	A	6/1998	Agravante et al.
5,632,551	A	5/1997	Roney et al.	5,768,020	A	6/1998	Nagao
5,634,709	A	6/1997	Iwama	5,775,762	A	7/1998	Vitito
5,640,216	A	6/1997	Hasegawa et al.	5,777,779	A	7/1998	Hashimoto et al.
5,642,238	A	6/1997	Sala	5,780,160	A	7/1998	Allemand et al.
5,644,851	A	7/1997	Blank et al.	5,786,772	A	7/1998	Schofield et al.
				5,788,357	A	8/1998	Muth et al.
				5,790,298	A	8/1998	Tonar
				5,790,502	A	8/1998	Horinouchi et al.
				5,790,973	A	8/1998	Blaker et al.

(56)

## References Cited

## U.S. PATENT DOCUMENTS

5,793,027 A	8/1998	Baik et al.	5,940,201 A	8/1999	Ash et al.
5,793,308 A	8/1998	Rosinski et al.	5,940,503 A	8/1999	Palett et al.
5,793,420 A	8/1998	Schmidt	5,942,895 A	8/1999	Popovic et al.
5,796,094 A	8/1998	Schofield et al.	5,947,586 A	9/1999	Weber
5,796,176 A	8/1998	Kramer et al.	5,949,331 A	9/1999	Schofield et al.
5,798,057 A	8/1998	Hikmet	5,949,345 A	9/1999	Beckert et al.
5,798,575 A	8/1998	O'Farrell et al.	5,949,506 A	9/1999	Jones et al.
5,798,688 A	8/1998	Schofield	5,956,079 A	9/1999	Ridgley
5,800,918 A	9/1998	Chartier et al.	5,956,181 A	9/1999	Lin
5,802,727 A	9/1998	Blank et al.	5,959,367 A	9/1999	O'Farrell et al.
5,803,579 A	9/1998	Turnbull et al.	5,959,555 A	9/1999	Furuta
5,805,330 A	9/1998	Byker et al.	5,959,577 A	9/1999	Fan et al.
5,805,367 A	9/1998	Kanazawa	5,962,833 A	10/1999	Hayashi
5,806,879 A	9/1998	Hamada et al.	5,963,247 A	10/1999	Banitt
5,806,965 A	9/1998	Deese	5,963,284 A	10/1999	Jones et al.
5,808,197 A	9/1998	Dao	5,965,247 A	10/1999	Jonza et al.
5,808,566 A	9/1998	Behr et al.	5,968,538 A	10/1999	Snyder, Jr.
5,808,589 A	9/1998	Ferguson	5,971,552 A	10/1999	O'Farrell et al.
5,808,713 A	9/1998	Broer et al.	5,973,760 A	10/1999	Dehmlow
5,808,777 A	9/1998	Lynam et al.	5,975,715 A	11/1999	Bauder
5,808,778 A	9/1998	Bauer et al.	5,984,482 A	11/1999	Rumsey et al.
5,812,321 A	9/1998	Schierbeek et al.	5,986,730 A	11/1999	Hansen et al.
5,813,745 A	9/1998	Fant, Jr. et al.	5,990,469 A	11/1999	Bechtel et al.
5,818,625 A	10/1998	Forgette et al.	5,990,625 A	11/1999	Meissner et al.
5,820,097 A	10/1998	Spooner	5,995,180 A	11/1999	Moriwaki et al.
5,820,245 A	10/1998	Desmond et al.	5,995,898 A	11/1999	Tuttle
5,822,023 A	10/1998	Suman et al.	5,998,617 A	12/1999	Srinivasa et al.
5,823,654 A	10/1998	Pastrick et al.	5,998,929 A	12/1999	Bechtel et al.
5,825,527 A	10/1998	Forgette et al.	6,000,823 A	12/1999	Desmond et al.
5,835,166 A	11/1998	Hall et al.	6,001,486 A	12/1999	Varaprasad et al.
5,837,994 A	11/1998	Stam et al.	6,002,511 A	12/1999	Varaprasad et al.
5,844,505 A	12/1998	Van Ryzin	6,002,983 A	12/1999	Alland et al.
5,848,373 A	12/1998	DeLorme et al.	6,005,724 A	12/1999	Todd
5,850,176 A	12/1998	Kinoshita et al.	6,007,222 A	12/1999	Thau
5,850,205 A	12/1998	Blouin	6,008,486 A	12/1999	Stam et al.
5,863,116 A	1/1999	Pastrick et al.	6,008,871 A	12/1999	Okumura
5,864,419 A	1/1999	Lynam	6,009,359 A	12/1999	El-Hakim et al.
5,867,801 A	2/1999	Denny	6,011,518 A	1/2000	Yamagishi et al.
5,871,275 A	2/1999	O'Farrell et al.	6,016,035 A	1/2000	Eberspächer et al.
5,871,843 A	2/1999	Yoneda et al.	6,016,215 A	1/2000	Byker
5,872,513 A	2/1999	Fitzgibbon et al.	6,019,411 A	2/2000	Carter et al.
5,877,707 A	3/1999	Kowalick	6,019,475 A	2/2000	Lynam et al.
5,877,897 A	3/1999	Schofield et al.	6,020,987 A	2/2000	Baummann et al.
5,878,353 A	3/1999	ul Azam et al.	6,021,371 A	2/2000	Fultz
5,878,370 A	3/1999	Olson	6,023,229 A	2/2000	Bugno et al.
5,879,074 A	3/1999	Pastrick	6,025,872 A	2/2000	Ozaki et al.
5,883,605 A	3/1999	Knapp	6,028,537 A	2/2000	Suman et al.
5,883,739 A	3/1999	Ashihara et al.	6,037,689 A	3/2000	Bingle et al.
5,888,431 A	3/1999	Tonar et al.	6,040,939 A	3/2000	Demiryont et al.
5,894,196 A	4/1999	McDermott	6,042,253 A	3/2000	Fant, Jr. et al.
D409,540 S	5/1999	Muth	6,042,934 A	3/2000	Guiselin et al.
5,899,551 A	5/1999	Neijzen et al.	6,045,243 A	4/2000	Muth et al.
5,899,956 A	5/1999	Chan	6,045,643 A	4/2000	Byker et al.
5,904,729 A	5/1999	Ruzicka	6,046,766 A	4/2000	Sakata
5,910,854 A	6/1999	Varaprasad et al.	6,046,837 A	4/2000	Yamamoto
5,914,815 A	6/1999	Bos	6,049,171 A	4/2000	Stam et al.
5,917,664 A	6/1999	O'Neill et al.	D425,466 S	5/2000	Todd et al.
5,917,944 A	6/1999	Wakisaka et al.	6,060,989 A	5/2000	Gehlot
5,918,180 A	6/1999	Dimino	6,061,002 A	5/2000	Weber et al.
5,922,176 A	7/1999	Caskey	6,062,920 A	5/2000	Jordan et al.
5,923,027 A	7/1999	Stam et al.	6,064,508 A	5/2000	Forgette et al.
5,923,457 A	7/1999	Byker et al.	6,065,840 A	5/2000	Caskey et al.
5,924,212 A	7/1999	Domanski	6,066,920 A	5/2000	Torihara et al.
5,926,087 A	7/1999	Busch et al.	6,067,111 A	5/2000	Hahn et al.
5,927,792 A	7/1999	Welling et al.	6,067,500 A	5/2000	Morimoto et al.
5,928,572 A	7/1999	Tonar et al.	6,068,380 A	5/2000	Lynn et al.
5,929,786 A	7/1999	Schofield et al.	D426,506 S	6/2000	Todd et al.
5,931,555 A	8/1999	Akahane et al.	D426,507 S	6/2000	Todd et al.
5,935,702 A	8/1999	Macquart et al.	D427,128 S	6/2000	Mathieu
5,936,774 A	8/1999	Street	6,072,391 A	6/2000	Suzukie et al.
5,938,320 A	8/1999	Crandall	6,074,077 A	6/2000	Pastrick et al.
5,938,321 A	8/1999	Bos et al.	6,074,777 A	6/2000	Reimers et al.
5,938,721 A	8/1999	Dussell et al.	6,076,948 A	6/2000	Bukosky et al.
5,940,011 A	8/1999	Agravante et al.	6,078,355 A	6/2000	Zengel
5,940,120 A	8/1999	Frankhouse et al.	6,078,865 A	6/2000	Koyanagi
			D428,372 S	7/2000	Todd et al.
			D428,373 S	7/2000	Todd et al.
			6,082,881 A	7/2000	Hicks
			6,084,700 A	7/2000	Knapp et al.

(56)

## References Cited

## U.S. PATENT DOCUMENTS

6,086,131	A	7/2000	Bingle et al.	6,173,501	B1	1/2001	Blank et al.
6,086,229	A	7/2000	Pastrick	6,175,164	B1	1/2001	O'Farrell et al.
6,087,012	A	7/2000	Varaprasad et al.	6,175,300	B1	1/2001	Kendrick
6,087,953	A	7/2000	DeLine et al.	6,176,602	B1	1/2001	Pastrick et al.
6,091,343	A	7/2000	Dykema et al.	6,178,034	B1	1/2001	Allemand et al.
6,093,976	A	7/2000	Kramer et al.	6,178,377	B1	1/2001	Ishihara et al.
6,094,618	A	7/2000	Harada	6,181,387	B1	1/2001	Rosen
D428,842	S	8/2000	Todd et al.	6,182,006	B1	1/2001	Meek
D429,202	S	8/2000	Todd et al.	6,183,119	B1	2/2001	Desmond et al.
D430,088	S	8/2000	Todd et al.	6,184,679	B1	2/2001	Popovic et al.
6,097,023	A	8/2000	Schofield et al.	6,184,781	B1	2/2001	Ramakesavan
6,097,316	A	8/2000	Liaw et al.	6,185,492	B1	2/2001	Kagawa et al.
6,098,879	A	8/2000	Terranova	6,185,501	B1	2/2001	Smith et al.
6,099,131	A	8/2000	Fletcher et al.	6,188,505	B1	2/2001	Lompvey et al.
6,099,155	A	8/2000	Pastrick et al.	6,191,704	B1	2/2001	Takenaga et al.
6,102,546	A	8/2000	Carter	6,193,379	B1	2/2001	Tonar et al.
6,102,559	A	8/2000	Nold et al.	6,193,912	B1	2/2001	Thieste et al.
6,104,552	A	8/2000	Thau et al.	6,195,194	B1	2/2001	Roberts et al.
6,106,121	A	8/2000	Buckley et al.	6,196,688	B1	3/2001	Caskey et al.
6,111,498	A	8/2000	Jobes, I et al.	6,198,409	B1	3/2001	Schofield et al.
6,111,683	A	8/2000	Cammenga et al.	6,199,014	B1	3/2001	Walker et al.
6,111,684	A	8/2000	Forgette et al.	6,199,810	B1	3/2001	Wu et al.
6,111,685	A	8/2000	Tench et al.	6,200,010	B1	3/2001	Anders
6,111,696	A	8/2000	Allen et al.	6,201,642	B1	3/2001	Bos
6,115,086	A	9/2000	Rosen	6,206,553	B1	3/2001	Boddy et al.
6,115,651	A	9/2000	Cruz	6,207,083	B1	3/2001	Varaprasad et al.
6,116,743	A	9/2000	Hoek	6,210,008	B1	4/2001	Hoekstra et al.
6,118,219	A	9/2000	Okigami et al.	6,210,012	B1	4/2001	Broer
6,122,597	A	9/2000	Saneyoshi et al.	6,212,470	B1	4/2001	Seymour et al.
6,122,921	A	9/2000	Brezoczky et al.	6,217,181	B1	4/2001	Lynam et al.
6,124,647	A	9/2000	Marcus et al.	6,218,934	B1	4/2001	Regan
6,124,886	A	9/2000	DeLine et al.	6,222,447	B1	4/2001	Schofield et al.
6,127,919	A	10/2000	Wysin	6,222,460	B1	4/2001	DeLine et al.
6,127,945	A	10/2000	Mura-Smith	6,222,689	B1	4/2001	Higuchi et al.
6,128,576	A	10/2000	Nishimoto et al.	6,227,689	B1	5/2001	Miller
6,130,421	A	10/2000	Bechtel et al.	6,232,937	B1	5/2001	Jacobsen et al.
6,130,448	A	10/2000	Bauer et al.	6,236,514	B1	5/2001	Sato
6,132,072	A	10/2000	Turnbull et al.	6,239,851	B1	5/2001	Hatazawa et al.
6,137,620	A	10/2000	Guarr et al.	6,239,898	B1	5/2001	Byker et al.
6,139,171	A	10/2000	Waldmann	6,239,899	B1	5/2001	DeVries et al.
6,139,172	A	10/2000	Bos et al.	6,243,003	B1	6/2001	DeLine et al.
6,140,933	A	10/2000	Bugno et al.	6,244,716	B1	6/2001	Steenwyk et al.
6,142,656	A	11/2000	Kurth	6,245,262	B1	6/2001	Varaprasad et al.
6,146,003	A	11/2000	Thau	6,246,933	B1	6/2001	Bague
6,147,934	A	11/2000	Arikawa et al.	6,247,820	B1	6/2001	Van Order
6,148,261	A	11/2000	Obradovich et al.	6,249,214	B1	6/2001	Kashiwazaki
6,149,287	A	11/2000	Pastrick et al.	6,249,310	B1	6/2001	Lefkowitz
6,150,014	A	11/2000	Chu et al.	6,249,369	B1	6/2001	Theiste et al.
6,151,065	A	11/2000	Steed et al.	6,250,148	B1	6/2001	Lynam
6,151,539	A	11/2000	Bergholz et al.	6,250,766	B1	6/2001	Strumolo et al.
6,152,551	A	11/2000	Annas	6,250,783	B1	6/2001	Stidham et al.
6,152,590	A	11/2000	Fürst et al.	6,255,639	B1	7/2001	Stam et al.
6,154,149	A	11/2000	Tyckowski et al.	6,257,746	B1	7/2001	Todd et al.
6,154,306	A	11/2000	Varaprasad et al.	6,259,412	B1	7/2001	Duroux
6,157,294	A	12/2000	Urai et al.	6,259,475	B1	7/2001	Ramachandran et al.
6,157,418	A	12/2000	Rosen	6,260,608	B1	7/2001	Kim
6,157,424	A	12/2000	Eichenlaub	6,262,831	B1	7/2001	Bauer et al.
6,157,480	A	12/2000	Anderson et al.	6,262,842	B1	7/2001	Ouderkirk et al.
6,158,655	A	12/2000	DeVries, Jr. et al.	6,264,353	B1	7/2001	Caraher et al.
6,161,071	A	12/2000	Shuman et al.	6,265,968	B1	7/2001	Betzitza et al.
6,161,865	A	12/2000	Rose et al.	6,268,803	B1	7/2001	Gunderson et al.
6,164,564	A	12/2000	Franco et al.	6,268,837	B1	7/2001	Kobayashi et al.
6,166,625	A	12/2000	Teowee et al.	6,269,308	B1	7/2001	Kodaka et al.
6,166,629	A	12/2000	Hamma et al.	6,271,901	B1	8/2001	Ide et al.
6,166,698	A	12/2000	Turnbull et al.	6,274,221	B2	8/2001	Smith et al.
6,166,834	A	12/2000	Taketomi et al.	6,275,231	B1	8/2001	Obradovich
6,166,847	A	12/2000	Tench et al.	6,276,821	B1	8/2001	Pastrick et al.
6,166,848	A	12/2000	Cammenga et al.	6,276,822	B1	8/2001	Bedrosian et al.
6,167,255	A	12/2000	Kennedy, III et al.	6,277,471	B1	8/2001	Tang
6,167,755	B1	1/2001	Damson et al.	6,278,271	B1	8/2001	Schott
6,169,955	B1	1/2001	Fultz	6,278,377	B1	8/2001	DeLine et al.
6,170,956	B1	1/2001	Rumsey et al.	6,278,941	B1	8/2001	Yokoyama
6,172,600	B1	1/2001	Kakinama et al.	6,280,068	B1	8/2001	Mertens et al.
6,172,601	B1	1/2001	Wada et al.	6,280,069	B1	8/2001	Pastrick et al.
6,172,613	B1	1/2001	DeLine et al.	6,281,804	B1	8/2001	Haller et al.
				6,286,965	B1	9/2001	Caskey et al.
				6,286,984	B1	9/2001	Berg
				6,289,332	B2	9/2001	Menig et al.
				6,290,378	B1	9/2001	Buchalla et al.

(56)

**References Cited****U.S. PATENT DOCUMENTS**

6,291,905 B1	9/2001	Drummond et al.	6,419,300 B1	7/2002	Pavao et al.
6,291,906 B1	9/2001	Marcus et al.	6,420,036 B1	7/2002	Varaprasad et al.
6,294,989 B1	9/2001	Schofield et al.	6,420,800 B1	7/2002	LeVesque et al.
6,296,379 B1	10/2001	Pastrick	6,420,975 B1	7/2002	DeLine et al.
6,297,781 B1	10/2001	Turnbull et al.	6,421,081 B1	7/2002	Markus
6,299,333 B1	10/2001	Pastrick et al.	6,424,272 B1	7/2002	Gutta et al.
6,300,879 B1	10/2001	Regan et al.	6,424,273 B1	7/2002	Gutta et al.
6,301,039 B1	10/2001	Tench	6,424,786 B1	7/2002	Beeson et al.
6,304,173 B2	10/2001	Pala et al.	6,424,892 B1	7/2002	Matsuoka
6,305,807 B1	10/2001	Schierbeek	6,426,492 B1	7/2002	Bos et al.
6,310,611 B1	10/2001	Caldwell	6,426,568 B2	7/2002	Turnbull et al.
6,310,714 B1	10/2001	Lomprey et al.	6,427,349 B1	8/2002	Blank et al.
6,310,738 B1	10/2001	Chu	6,428,172 B1	8/2002	Hutzel et al.
6,313,454 B1	11/2001	Bos et al.	6,433,676 B2	8/2002	DeLine et al.
6,314,295 B1	11/2001	Kawamoto	6,433,680 B1	8/2002	Ho
6,315,440 B1	11/2001	Satoh	6,433,914 B1	8/2002	Lomprey et al.
6,317,057 B1	11/2001	Lee	6,437,688 B1	8/2002	Kobayashi
6,317,180 B1	11/2001	Kuroiwa et al.	6,438,491 B1	8/2002	Farmer
6,317,248 B1	11/2001	Agrawal et al.	6,439,755 B1	8/2002	Fant, Jr. et al.
6,318,870 B1	11/2001	Spooner et al.	6,441,872 B1	8/2002	Ho
6,320,176 B1	11/2001	Schofield et al.	6,441,943 B1	8/2002	Roberts et al.
6,320,282 B1	11/2001	Caldwell	6,441,963 B2	8/2002	Murakami et al.
6,320,612 B1	11/2001	Young	6,441,964 B1	8/2002	Chu et al.
6,324,295 B1	11/2001	Valery et al.	6,445,287 B1	9/2002	Schofield et al.
6,326,613 B1	12/2001	Heslin et al.	6,447,128 B1	9/2002	Lang et al.
6,326,900 B2	12/2001	DeLine et al.	6,449,082 B1	9/2002	Agrawal et al.
6,327,925 B1	12/2001	Gombert et al.	6,452,533 B1	9/2002	Yamabuchi et al.
6,329,925 B1	12/2001	Skiver et al.	6,452,572 B1	9/2002	Fan et al.
6,330,511 B2	12/2001	Ogura et al.	6,456,438 B1	9/2002	Lee et al.
6,331,066 B1	12/2001	Desmond et al.	6,462,795 B1	10/2002	Clarke
6,333,759 B1	12/2001	Mazzilli	6,463,369 B2	10/2002	Sadano et al.
6,335,680 B1	1/2002	Matsuoka	6,465,963 B1	10/2002	Turnbull et al.
6,336,737 B1	1/2002	Thau	6,466,701 B1	10/2002	Ejiri et al.
6,340,850 B2	1/2002	O'Farrell et al.	6,471,362 B1	10/2002	Carter et al.
6,341,523 B2	1/2002	Lynam	6,472,977 B1	10/2002	Pöchmüller
6,344,805 B1	2/2002	Yasui et al.	6,472,979 B2	10/2002	Schofield et al.
6,346,698 B1	2/2002	Turnbull	6,473,001 B1	10/2002	Blum
6,347,880 B1	2/2002	Fürst et al.	6,474,853 B2	11/2002	Pastrick et al.
6,348,858 B2	2/2002	Weis et al.	6,476,731 B1	11/2002	Miki et al.
6,351,708 B1	2/2002	Takagi et al.	6,476,855 B1	11/2002	Yamamoto
6,353,392 B1	3/2002	Schofield et al.	6,477,460 B2	11/2002	Kepler
6,356,206 B1	3/2002	Takenaga et al.	6,477,464 B2	11/2002	McCarthy et al.
6,356,376 B1	3/2002	Tonar et al.	6,483,429 B1	11/2002	Yasui et al.
6,356,389 B1	3/2002	Nilsen et al.	6,483,438 B2	11/2002	DeLine et al.
6,357,883 B1	3/2002	Strumolo et al.	6,483,613 B1	11/2002	Woodgate et al.
6,362,121 B1	3/2002	Chopin et al.	6,487,500 B2	11/2002	Lemelson et al.
6,362,548 B1	3/2002	Bingle et al.	6,494,602 B2	12/2002	Pastrick et al.
6,363,326 B1	3/2002	Scully	6,498,620 B2	12/2002	Schofield et al.
6,366,013 B1	4/2002	Leenders et al.	6,501,387 B2	12/2002	Skiver et al.
6,366,213 B2	4/2002	DeLine et al.	6,512,203 B2	1/2003	Jones et al.
6,369,701 B1	4/2002	Yoshida et al.	6,512,624 B2	1/2003	Tonar et al.
6,370,329 B1	4/2002	Teuchert	6,513,252 B1	2/2003	Schierbeek et al.
6,371,636 B1	4/2002	Wesson	6,515,378 B2	2/2003	Drummond et al.
6,379,013 B1	4/2002	Bechtel et al.	6,515,581 B1	2/2003	Ho
6,379,788 B2	4/2002	Choi et al.	6,515,582 B1	2/2003	Teowee
6,382,805 B1	5/2002	Miyabukuro	6,515,597 B1	2/2003	Wada et al.
6,385,139 B1	5/2002	Arikawa et al.	6,516,664 B2	2/2003	Lynam
6,386,742 B1	5/2002	DeLine et al.	6,518,691 B1	2/2003	Baba
6,390,529 B1	5/2002	Bingle et al.	6,519,209 B1	2/2003	Arikawa et al.
6,390,626 B2	5/2002	Knox	6,520,667 B1	2/2003	Mousseau
6,390,635 B2	5/2002	Whitehead et al.	6,522,451 B1	2/2003	Lynam
6,396,397 B1	5/2002	Bos et al.	6,522,969 B2	2/2003	Kannonji
6,396,408 B2	5/2002	Drummond et al.	6,525,707 B1	2/2003	Kaneko et al.
6,396,637 B2	5/2002	Roest et al.	6,534,884 B2	3/2003	Marcus et al.
6,407,468 B1	6/2002	LeVesque et al.	6,538,709 B1	3/2003	Kurihara et al.
6,407,847 B1	6/2002	Poll et al.	6,539,306 B2	3/2003	Turnbull et al.
6,408,247 B1	6/2002	Ichikawa et al.	6,542,085 B1	4/2003	Yang
6,411,204 B1	6/2002	Bloomfield et al.	6,542,182 B1	4/2003	Chutorash
6,412,959 B1	7/2002	Tseng	6,543,163 B1	4/2003	Ginsberg
6,412,973 B1	7/2002	Bos et al.	6,545,598 B1	4/2003	de Villeroche
6,414,910 B1	7/2002	Kaneko et al.	6,547,133 B1	4/2003	DeVries, Jr. et al.
6,415,230 B1	7/2002	Maruko et al.	6,549,253 B1	4/2003	Robbie et al.
6,416,208 B2	7/2002	Pastrick et al.	6,549,335 B1	4/2003	Trapani et al.
6,417,786 B2	7/2002	Learman et al.	6,550,949 B1	4/2003	Bauer et al.
6,418,376 B1	7/2002	Olson	6,552,326 B2	4/2003	Turnbull
			6,552,653 B2	4/2003	Nakaho et al.
			6,553,308 B1	4/2003	Uhlmann et al.
			6,559,761 B1	5/2003	Miller et al.
			6,559,902 B1	5/2003	Kusuda et al.



(56)

**References Cited**

## U.S. PATENT DOCUMENTS

6,560,004 B2	5/2003	Theiste et al.	6,679,608 B2	1/2004	Bechtel et al.
6,560,027 B2	5/2003	Meine	6,683,539 B2	1/2004	Trajkovic et al.
6,566,821 B2	5/2003	Nakatsuka et al.	6,683,969 B1	1/2004	Nishigaki et al.
6,567,060 B1	5/2003	Sekiguchi	6,685,348 B2	2/2004	Pastrick et al.
6,567,708 B1	5/2003	Bechtel et al.	6,690,262 B1	2/2004	Winnett
6,568,839 B1	5/2003	Pastrick et al.	6,690,268 B2	2/2004	Schofield et al.
6,572,233 B1	6/2003	Northman et al.	6,690,413 B1	2/2004	Moore
6,573,957 B1	6/2003	Suzuki	6,690,438 B2	2/2004	Sekiguchi
6,573,963 B2	6/2003	Ouder Kirk et al.	6,693,517 B2	2/2004	McCarthy et al.
6,575,582 B2	6/2003	Tenmyo	6,693,518 B2	2/2004	Kumata et al.
6,575,643 B2	6/2003	Takashashi	6,693,519 B2	2/2004	Keirstead
6,578,989 B2	6/2003	Osumi et al.	6,693,524 B1	2/2004	Payne
6,580,373 B1	6/2003	Ohashi	6,700,692 B2	3/2004	Tonar et al.
6,580,479 B1	6/2003	Sekiguchi et al.	6,704,434 B1	3/2004	Sakoh et al.
6,580,562 B2	6/2003	Aoki et al.	6,709,136 B2	3/2004	Pastrick et al.
6,581,007 B2	6/2003	Hasegawa et al.	6,713,783 B1	3/2004	Mase et al.
6,583,730 B2	6/2003	Lang et al.	6,717,109 B1	4/2004	Macher et al.
6,591,192 B2	7/2003	Okamura et al.	6,717,610 B1	4/2004	Bos et al.
6,592,230 B2	7/2003	Dupay	6,717,712 B2	4/2004	Lynam et al.
6,593,565 B2	7/2003	Heslin et al.	6,719,215 B2	4/2004	Drouillard
6,593,984 B2	7/2003	Arakawa et al.	6,724,446 B2	4/2004	Motomura et al.
6,594,065 B2	7/2003	Byker et al.	6,726,337 B2	4/2004	Whitehead et al.
6,594,067 B2	7/2003	Poll et al.	6,727,807 B2	4/2004	Trajkovic et al.
6,594,090 B2	7/2003	Kruschwitz et al.	6,727,808 B1	4/2004	Uselmann et al.
6,594,583 B2	7/2003	Ogura et al.	6,727,844 B1	4/2004	Zimmermann et al.
6,594,614 B2	7/2003	Studt et al.	6,731,332 B1	5/2004	Yasui et al.
6,595,649 B2	7/2003	Hoekstra et al.	6,734,807 B2	5/2004	King
6,597,489 B1	7/2003	Guarr et al.	6,736,526 B2	5/2004	Matsuba et al.
6,606,183 B2	8/2003	Ikai et al.	6,737,629 B2	5/2004	Nixon et al.
6,611,202 B2	8/2003	Schofield et al.	6,737,630 B2	5/2004	Turnbull
6,611,227 B1	8/2003	Nebiyeloul-Kifle et al.	6,737,964 B2	5/2004	Samman et al.
6,611,759 B2	8/2003	Brosche	6,738,088 B1	5/2004	Uskolovsky et al.
6,612,723 B2	9/2003	Futhey et al.	6,742,904 B2	6/2004	Bechtel et al.
6,614,387 B1	9/2003	Deadman	6,742,905 B2	6/2004	Suyama et al.
6,614,419 B1	9/2003	May	6,744,353 B2	6/2004	Sjönell
6,614,579 B2	9/2003	Roberts et al.	6,746,127 B2	6/2004	Suyama
6,615,438 B1	9/2003	Franco et al.	6,746,775 B1	6/2004	Boire et al.
6,616,288 B2	9/2003	Duroux et al.	6,747,716 B2	6/2004	Kuroiwa et al.
6,616,313 B2	9/2003	Fürst et al.	6,748,211 B1	6/2004	Isaac et al.
6,616,764 B2	9/2003	Krämer et al.	6,749,308 B1	6/2004	Niendorf et al.
6,618,672 B2	9/2003	Sasaki et al.	6,755,542 B2	6/2004	Bechtel et al.
6,621,616 B1	9/2003	Bauer et al.	6,756,912 B2	6/2004	Skiver et al.
6,624,936 B2	9/2003	Kotchick et al.	6,757,039 B2	6/2004	Ma
6,627,918 B2	9/2003	Getz al.	6,757,109 B2	6/2004	Bos
6,630,888 B2	10/2003	Lang et al.	D493,131 S	7/2004	Lawlor et al.
6,636,190 B2	10/2003	Hirakata et al.	D493,394 S	7/2004	Lawlor et al.
6,636,258 B2	10/2003	Strumolo	6,759,113 B1	7/2004	Tang
6,638,582 B1	10/2003	Uchiyama et al.	6,759,945 B2	7/2004	Richard
6,639,360 B2	10/2003	Roberts et al.	6,760,157 B1	7/2004	Allen et al.
6,642,840 B2	11/2003	Lang et al.	6,765,480 B2	7/2004	Tseng
6,642,851 B2	11/2003	DeLine et al.	6,773,116 B2	8/2004	De Vaan et al.
6,646,697 B1	11/2003	Sekiguchi et al.	6,774,356 B2	8/2004	Heslin et al.
6,648,477 B2	11/2003	Hutzel et al.	6,774,810 B2	8/2004	DeLine et al.
6,650,457 B2	11/2003	Busscher et al.	6,778,904 B2	8/2004	Iwami et al.
6,657,607 B1	12/2003	Evanicky et al.	6,779,900 B1	8/2004	Nolan-Brown
6,661,482 B2	12/2003	Hara	6,781,738 B2	8/2004	Kikuchi et al.
6,661,830 B1	12/2003	Reed et al.	6,782,718 B2	8/2004	Lingle et al.
6,663,262 B2	12/2003	Boyd et al.	6,784,129 B2	8/2004	Seto et al.
6,665,592 B2	12/2003	Kodama	6,797,396 B1	9/2004	Liu et al.
6,667,726 B1	12/2003	Damiani et al.	6,800,871 B2	10/2004	Matsuda et al.
6,669,109 B2	12/2003	Ivanov et al.	6,801,127 B2	10/2004	Mizusawa et al.
6,669,285 B1	12/2003	Park et al.	6,801,244 B2	10/2004	Takeda et al.
6,670,207 B1	12/2003	Roberts	6,801,283 B2	10/2004	Koyama et al.
6,670,910 B2	12/2003	Delcheccolo et al.	6,805,474 B2	10/2004	Walser et al.
6,670,935 B2	12/2003	Yeon et al.	6,806,452 B2	10/2004	Bos et al.
6,670,941 B2	12/2003	Albu et al.	6,806,922 B2	10/2004	Ishitaka
6,671,080 B2	12/2003	Poll et al.	6,810,323 B1	10/2004	Bullock et al.
6,672,731 B2	1/2004	Schnell et al.	6,812,463 B2	11/2004	Okada
6,672,734 B2	1/2004	Lammers	6,812,907 B1	11/2004	Gennetten et al.
6,672,744 B2	1/2004	DeLine et al.	6,819,231 B2	11/2004	Berberich et al.
6,672,745 B1	1/2004	Bauer et al.	6,823,261 B2	11/2004	Sekiguchi
6,674,370 B2	1/2004	Rodewald et al.	6,824,281 B2	11/2004	Schofield et al.
6,675,075 B1	1/2004	Engelsberg et al.	6,831,268 B2	12/2004	Bechtel et al.
6,678,083 B1	1/2004	Anstee	6,832,848 B2	12/2004	Pastrick
6,678,614 B2	1/2004	McCarthy et al.	6,834,969 B2	12/2004	Bade et al.
			6,836,725 B2	12/2004	Millington et al.
			6,838,980 B2	1/2005	Gloger et al.
			6,842,189 B2	1/2005	Park
			6,842,276 B2	1/2005	Poll et al.

(56)

## References Cited

## U.S. PATENT DOCUMENTS

6,845,805	B1	1/2005	Köster	7,008,090	B2	3/2006	Blank
6,846,098	B2	1/2005	Bourdelais et al.	7,009,751	B2	3/2006	Tonar et al.
6,847,424	B2	1/2005	Gotoh et al.	7,012,543	B2	3/2006	DeLine et al.
6,847,487	B2	1/2005	Burgner	7,012,727	B2	3/2006	Hutzel et al.
6,848,817	B2	2/2005	Bos et al.	7,023,331	B2	4/2006	Kodama
6,849,165	B2	2/2005	Klöppel et al.	7,029,156	B2	4/2006	Suehiro et al.
6,853,491	B1	2/2005	Ruhle et al.	7,030,738	B2	4/2006	Ishii
6,859,148	B2	2/2005	Miller et al.	7,030,775	B2	4/2006	Sekiguchi
6,861,789	B2	3/2005	Wei	7,038,577	B2	5/2006	Pawlicki et al.
6,870,655	B1	3/2005	Northman et al.	7,041,965	B2	5/2006	Heslin et al.
6,870,656	B2	3/2005	Tonar et al.	7,042,616	B2	5/2006	Tonar et al.
6,871,982	B2	3/2005	Holman et al.	7,046,418	B2	5/2006	Lin et al.
6,877,888	B2	4/2005	DeLine et al.	7,046,448	B2	5/2006	Burgner
6,880,750	B2	4/2005	Pentel	7,050,908	B1	5/2006	Schwartz et al.
6,882,287	B2	4/2005	Schofield	7,057,505	B2	6/2006	Iwamoto
6,889,064	B2	5/2005	Baratono et al.	7,057,681	B2	6/2006	Hinata et al.
6,891,563	B2	5/2005	Schofield et al.	7,063,893	B2	6/2006	Hoffman
6,891,677	B2	5/2005	Nilsen et al.	7,064,882	B2	6/2006	Tonar et al.
6,898,518	B2	5/2005	Padmanabhan	7,068,289	B2	6/2006	Satoh et al.
6,902,284	B2	6/2005	Hutzel et al.	7,074,486	B2	7/2006	Boire et al.
6,904,348	B2	6/2005	Drummond et al.	7,081,810	B2	7/2006	Henderson et al.
6,906,620	B2	6/2005	Nakai et al.	7,085,633	B2	8/2006	Nishira et al.
6,906,632	B2	6/2005	DeLine et al.	7,092,052	B2	8/2006	Okamoto et al.
6,909,361	B2	6/2005	McCarthy et al.	7,095,432	B2	8/2006	Nakayama et al.
6,909,486	B2	6/2005	Wang et al.	7,095,567	B2	8/2006	Troxell et al.
6,910,779	B2	6/2005	Abel et al.	7,106,213	B2	9/2006	White
6,912,001	B2	6/2005	Okamoto et al.	7,106,392	B2	9/2006	You
6,912,396	B2	6/2005	Sziraki et al.	7,108,409	B2	9/2006	DeLine et al.
6,914,521	B2	7/2005	Rothkop	7,110,021	B2	9/2006	Nobori et al.
6,916,099	B2	7/2005	Su et al.	7,114,554	B2	10/2006	Bergman et al.
6,917,404	B2	7/2005	Baek	7,121,028	B2	10/2006	Shoen et al.
6,918,674	B2	7/2005	Drummond et al.	7,125,131	B2	10/2006	Olczak
6,922,902	B2	8/2005	Schierbeek et al.	7,130,727	B2	10/2006	Liu et al.
6,923,080	B1	8/2005	Dobler et al.	7,132,064	B2	11/2006	Li et al.
6,928,180	B2	8/2005	Stam et al.	7,136,091	B2	11/2006	Ichikawa et al.
6,928,366	B2	8/2005	Ockerse et al.	7,138,974	B2	11/2006	Hirakata et al.
6,930,737	B2	8/2005	Weindorf et al.	7,149,613	B2	12/2006	Stam et al.
6,933,837	B2	8/2005	Gunderson et al.	7,150,552	B2	12/2006	Weidel
6,934,067	B2	8/2005	Ash et al.	7,151,515	B2	12/2006	Kim et al.
6,940,423	B2	9/2005	Takagi et al.	7,151,997	B2	12/2006	Uhlmann et al.
6,946,978	B2	9/2005	Schofield	7,153,588	B2	12/2006	McMan et al.
6,947,576	B2	9/2005	Stam et al.	7,154,657	B2	12/2006	Poll et al.
6,947,577	B2	9/2005	Stam et al.	7,158,881	B2	1/2007	McCarthy et al.
6,949,772	B2	9/2005	Shimizu et al.	7,160,017	B2	1/2007	Lee et al.
6,950,035	B2	9/2005	Tanaka et al.	7,161,567	B2	1/2007	Homma et al.
6,951,410	B2	10/2005	Parsons	7,167,796	B2	1/2007	Taylor et al.
6,951,681	B2	10/2005	Hartley et al.	7,168,830	B2	1/2007	Pastrick et al.
6,952,312	B2	10/2005	Weber et al.	7,175,291	B1	2/2007	Li
6,954,300	B2	10/2005	Varaprasad et al.	7,176,790	B2	2/2007	Yamazaki
6,958,495	B2	10/2005	Nishijima et al.	7,184,190	B2	2/2007	McCabe et al.
6,958,683	B2	10/2005	Mills et al.	7,185,995	B2	3/2007	Hatanaka et al.
6,959,994	B2	11/2005	Fujikawa et al.	7,187,498	B2	3/2007	Bengoechea et al.
6,961,178	B2	11/2005	Sugino et al.	7,188,963	B2	3/2007	Schofield et al.
6,961,661	B2	11/2005	Sekiguchi	7,193,764	B2	3/2007	Lin et al.
6,963,438	B2	11/2005	Busscher et al.	7,195,381	B2	3/2007	Lynam et al.
6,967,569	B2	11/2005	Weber et al.	7,199,767	B2	4/2007	Spero
6,968,273	B2	11/2005	Ockerse et al.	7,202,987	B2	4/2007	Varaprasad et al.
6,971,181	B2	12/2005	Ohm et al.	7,206,697	B2	4/2007	Olney et al.
6,972,888	B2	12/2005	Poll et al.	7,209,277	B2	4/2007	Tonar et al.
6,974,236	B2	12/2005	Tenmyo	7,215,238	B2	5/2007	Buck et al.
6,975,215	B2	12/2005	Schofield et al.	7,215,473	B2	5/2007	Fleming
6,977,702	B2	12/2005	Wu	7,221,363	B2	5/2007	Roberts et al.
6,980,092	B2	12/2005	Turnbull et al.	7,221,365	B1	5/2007	Lévesque et al.
6,985,291	B2	1/2006	Watson et al.	7,224,324	B2	5/2007	Quist et al.
6,989,736	B2	1/2006	Berberich et al.	7,227,472	B1	6/2007	Roe
6,992,573	B2	1/2006	Blank et al.	7,230,523	B2	6/2007	Harter, Jr. et al.
6,992,718	B1	1/2006	Takahara	7,232,231	B2	6/2007	Shih
6,992,826	B2	1/2006	Wang	7,232,594	B2	6/2007	Miroshin et al.
6,995,687	B2	2/2006	Lang et al.	7,233,304	B1	6/2007	Aratani et al.
6,997,571	B2	2/2006	Tenmyo	7,235,918	B2	6/2007	McCullough et al.
7,001,058	B2	2/2006	Inditsky	7,241,030	B2	7/2007	Mok et al.
7,004,592	B2	2/2006	Varaprasad et al.	7,241,037	B2	7/2007	Mathieu et al.
7,004,593	B2	2/2006	Weller et al.	7,245,207	B1	7/2007	Dayan et al.
7,005,974	B2	2/2006	McMahon et al.	7,245,231	B2	7/2007	Kiefer et al.
7,006,173	B1	2/2006	Hiyama et al.	7,245,336	B2	7/2007	Hiyama et al.
				7,248,283	B2	7/2007	Takagi et al.
				7,248,305	B2	7/2007	Ootsuta et al.
				7,249,860	B2	7/2007	Kulas et al.
				7,251,079	B2	7/2007	Capaldo et al.

(56)

**References Cited**

## U.S. PATENT DOCUMENTS

7,253,723 B2	8/2007	Lindahl et al.	7,453,057 B2	11/2008	Drummond et al.
7,255,451 B2	8/2007	McCabe et al.	7,455,412 B2	11/2008	Rottcher
7,255,465 B2	8/2007	DeLine et al.	7,460,007 B2	12/2008	Schofield et al.
7,259,036 B2	8/2007	Borland et al.	7,467,883 B2	12/2008	DeLine et al.
7,262,406 B2	8/2007	Heslin et al.	7,468,651 B2	12/2008	DeLine et al.
7,262,916 B2	8/2007	Kao et al.	7,471,438 B2	12/2008	McCabe et al.
7,265,342 B2	9/2007	Heslin et al.	7,474,963 B2	1/2009	Taylor et al.
7,268,841 B2	9/2007	Kasajima et al.	7,477,439 B2	1/2009	Tonar et al.
7,269,327 B2	9/2007	Tang	7,480,149 B2	1/2009	DeWard et al.
7,269,328 B2	9/2007	Tang	7,488,080 B2	2/2009	Skiver et al.
7,271,951 B2	9/2007	Weber et al.	7,488,099 B2	2/2009	Fogg et al.
7,274,501 B2	9/2007	McCabe et al.	7,489,374 B2	2/2009	Utsumi et al.
7,281,491 B2	10/2007	Iwamaru	7,490,007 B2	2/2009	Taylor et al.
7,286,280 B2	10/2007	Whitehead et al.	7,490,943 B2	2/2009	Kikuchi et al.
7,287,868 B2	10/2007	Carter et al.	7,490,944 B2	2/2009	Blank et al.
7,289,037 B2	10/2007	Uken et al.	7,494,231 B2	2/2009	Varaprasad et al.
7,290,919 B2	11/2007	Pan et al.	7,495,719 B2	2/2009	Adachi et al.
7,292,208 B1	11/2007	Park et al.	7,496,439 B2	2/2009	McCormick
7,292,918 B2	11/2007	Silvester	7,502,156 B2	3/2009	Tonar et al.
7,300,183 B2	11/2007	Kiyomoto et al.	7,505,047 B2	3/2009	Yoshimura
7,302,344 B2	11/2007	Olney et al.	7,505,188 B2	3/2009	Niiyama et al.
7,304,661 B2	12/2007	Ishikura	7,511,607 B2	3/2009	Hubbard et al.
7,308,341 B2	12/2007	Schofield et al.	7,511,872 B2	3/2009	Tonar et al.
7,310,177 B2	12/2007	McCabe et al.	7,525,604 B2	4/2009	Xue
7,311,428 B2	12/2007	DeLine et al.	7,525,715 B2	4/2009	McCabe et al.
7,316,485 B2	1/2008	Roose	7,526,103 B2	4/2009	Schofield et al.
7,317,386 B2	1/2008	Lengning et al.	7,533,998 B2	5/2009	Schofield et al.
7,318,664 B2	1/2008	Hatanaka et al.	7,538,316 B2	5/2009	Heslin et al.
7,323,819 B2	1/2008	Hong et al.	7,540,620 B2	6/2009	Weller et al.
7,324,043 B2	1/2008	Purden et al.	7,541,570 B2	6/2009	Drummond et al.
7,324,172 B2	1/2008	Yamazaki et al.	7,542,193 B2	6/2009	McCabe et al.
7,324,174 B2	1/2008	Hafuka et al.	7,543,946 B2	6/2009	Ockerse et al.
7,324,261 B2	1/2008	Tonar et al.	7,543,947 B2	6/2009	Varaprasad et al.
7,327,225 B2	2/2008	Nicholas et al.	7,545,429 B2	6/2009	Travis
7,327,226 B2	2/2008	Turnbull et al.	7,547,467 B2	6/2009	Olson et al.
7,327,855 B1	2/2008	Chen	7,548,291 B2	6/2009	Lee et al.
7,328,103 B2	2/2008	McCarthy et al.	7,551,354 B2	6/2009	Horsten et al.
7,329,013 B2	2/2008	Blank et al.	7,561,181 B2	7/2009	Schofield et al.
7,329,850 B2	2/2008	Drummond et al.	7,562,985 B2	7/2009	Cortenraad et al.
7,331,415 B2	2/2008	Hawes et al.	7,567,291 B2	7/2009	Bechtel et al.
7,338,177 B2	3/2008	Lynam	7,571,038 B2	8/2009	Butler et al.
7,342,707 B2	3/2008	Roberts et al.	7,571,042 B2	8/2009	Taylor et al.
7,344,284 B2	3/2008	Lynam et al.	7,572,017 B2	8/2009	Varaprasad et al.
7,349,143 B2	3/2008	Tonar et al.	7,572,490 B2	8/2009	Park et al.
7,349,144 B2	3/2008	Varaprasad et al.	7,579,939 B2	8/2009	Schofield et al.
7,349,582 B2	3/2008	Takeda et al.	7,579,940 B2	8/2009	Schofield et al.
7,355,524 B2	4/2008	Schofield	7,580,795 B2	8/2009	McCarthy et al.
7,360,932 B2	4/2008	Uken et al.	7,581,859 B2	9/2009	Lynam
7,362,505 B2	4/2008	Hikmet et al.	7,581,867 B2	9/2009	Lee et al.
7,368,714 B2	5/2008	Remillard et al.	7,583,184 B2	9/2009	Schofield et al.
7,370,983 B2	5/2008	DeWind et al.	7,583,204 B2	9/2009	McCarthy et al.
7,372,611 B2	5/2008	Tonar et al.	7,586,566 B2	9/2009	Nelson et al.
7,375,895 B2	5/2008	Brynielsson	7,586,666 B2	9/2009	McCabe et al.
7,379,224 B2	5/2008	Tonar et al.	7,589,883 B2	9/2009	Varaprasad et al.
7,379,225 B2	5/2008	Tonar et al.	7,589,893 B2	9/2009	Rottcher
7,379,243 B2	5/2008	Horsten et al.	7,600,878 B2	10/2009	Blank et al.
7,379,814 B2	5/2008	Ockerse et al.	7,605,883 B2	10/2009	Yamaki et al.
7,379,817 B1	5/2008	Tyson et al.	7,619,508 B2	11/2009	Lynam et al.
7,380,633 B2	6/2008	Shen et al.	7,623,202 B2	11/2009	Araki et al.
7,382,289 B2	6/2008	McCarthy et al.	7,626,749 B2	12/2009	Baur et al.
7,389,171 B2	6/2008	Rupp	7,629,996 B2	12/2009	Rademacher et al.
7,391,563 B2	6/2008	McCabe et al.	7,633,567 B2	12/2009	Yamada et al.
7,396,147 B2	7/2008	Munro	7,636,188 B2	12/2009	Baur et al.
7,411,637 B2	8/2008	Weiss	7,636,195 B2	12/2009	Nieuwkerk et al.
7,411,732 B2	8/2008	Kao et al.	7,636,930 B2	12/2009	Chang
7,412,328 B2	8/2008	Uhlmann et al.	7,643,200 B2	1/2010	Varaprasad et al.
7,417,781 B2	8/2008	Tonar et al.	7,643,927 B2	1/2010	Hils
7,420,159 B2	9/2008	Heslin et al.	7,651,228 B2	1/2010	Skiver et al.
7,420,756 B2	9/2008	Lynam	7,658,521 B2	2/2010	DeLine et al.
7,429,998 B2	9/2008	Kawauchi et al.	7,663,798 B2	2/2010	Tonar et al.
7,446,462 B2	11/2008	Lim et al.	7,667,579 B2	2/2010	DeLine et al.
7,446,650 B2	11/2008	Schofield et al.	7,670,016 B2	3/2010	Weller et al.
7,446,924 B2	11/2008	Schofield et al.	7,688,495 B2	3/2010	Tonar et al.
7,448,776 B2	11/2008	Tang	7,695,174 B2	4/2010	Takayanagi et al.
7,452,090 B2	11/2008	Weller et al.	7,696,964 B2	4/2010	Lankhorst et al.
			7,706,046 B2	4/2010	Bauer et al.
			7,710,631 B2	5/2010	McCabe et al.
			7,711,479 B2	5/2010	Taylor et al.
			7,724,434 B2	5/2010	Cross et al.

(56)

## References Cited

## U.S. PATENT DOCUMENTS

7,726,822 B2	6/2010	Blank et al.	8,217,887 B2	7/2012	Sangam et al.
7,728,276 B2	6/2010	Drummond et al.	8,228,588 B2	7/2012	McCabe et al.
7,728,721 B2	6/2010	Schofield et al.	8,237,909 B2	8/2012	Ostreko et al.
7,728,927 B2	6/2010	Nieuwkerk et al.	8,254,011 B2	8/2012	Baur et al.
7,731,403 B2	6/2010	Lynam et al.	8,267,559 B2	9/2012	DeLine et al.
7,734,392 B2	6/2010	Schofield et al.	8,271,187 B2	9/2012	Taylor et al.
7,742,864 B2	6/2010	Sekiguchi	8,277,059 B2	10/2012	McCabe et al.
7,746,534 B2	6/2010	Tonar et al.	8,282,224 B2	10/2012	Anderson et al.
7,771,061 B2	8/2010	Varaprasad et al.	8,282,226 B2	10/2012	Blank et al.
7,787,077 B2	8/2010	Kondoh et al.	8,282,253 B2	10/2012	Lynam
7,791,694 B2	9/2010	Molsen et al.	8,288,711 B2	10/2012	Heslin et al.
7,795,675 B2	9/2010	Darwish et al.	8,294,975 B2	10/2012	Varaprasad et al.
7,815,326 B2	10/2010	Blank et al.	8,304,711 B2	11/2012	Drummond et al.
7,821,697 B2	10/2010	Varaprasad et al.	8,308,325 B2	11/2012	Takayanagi et al.
7,822,543 B2	10/2010	Taylor et al.	8,309,907 B2	11/2012	Heslin et al.
7,826,123 B2	11/2010	McCabe et al.	8,325,028 B2	12/2012	Schofield et al.
7,830,583 B2	11/2010	Neuman et al.	8,335,032 B2	12/2012	McCabe et al.
7,832,882 B2	11/2010	Weller et al.	8,339,526 B2	12/2012	Minikay, Jr. et al.
7,842,154 B2	11/2010	Lynam	8,355,853 B2	1/2013	Schofield et al.
7,854,514 B2	12/2010	Conner et al.	8,358,262 B2	1/2013	Degwekar et al.
7,855,755 B2	12/2010	Weller et al.	8,379,289 B2	2/2013	Schofield et al.
7,859,565 B2	12/2010	Schofield et al.	8,400,704 B2	3/2013	McCabe et al.
7,859,737 B2	12/2010	McCabe et al.	8,427,288 B2	4/2013	Schofield et al.
7,864,398 B2	1/2011	Dozeman et al.	8,432,600 B2	4/2013	Brown et al.
7,864,399 B2	1/2011	McCabe et al.	8,462,204 B2	6/2013	Schofield et al.
7,871,169 B2	1/2011	Varaprasad et al.	8,465,162 B2	6/2013	Weller et al.
7,873,593 B2	1/2011	Schofield et al.	8,465,163 B2	6/2013	Blank et al.
7,888,629 B2	2/2011	Heslin et al.	8,482,683 B2	7/2013	Hwang et al.
7,898,398 B2	3/2011	DeLine et al.	8,506,096 B2	8/2013	McCabe et al.
7,898,719 B2	3/2011	Schofield et al.	8,508,383 B2	8/2013	Peterson et al.
7,903,324 B2	3/2011	Kobayashi et al.	8,508,384 B2	8/2013	Uken et al.
7,903,335 B2	3/2011	Nieuwkerk et al.	8,511,841 B2	8/2013	Varaprasad et al.
7,906,756 B2	3/2011	Drummond et al.	8,520,069 B2	8/2013	Haler
7,911,547 B2	3/2011	Brott et al.	8,525,703 B2	9/2013	McCarthy et al.
7,914,188 B2	3/2011	DeLine et al.	8,543,330 B2	9/2013	Taylor et al.
7,916,009 B2	3/2011	Schofield et al.	8,545,030 B2	10/2013	Anderson et al.
7,916,380 B2	3/2011	Tonar et al.	8,559,093 B2	10/2013	Varaprasad et al.
7,918,570 B2	4/2011	Weller et al.	8,577,549 B2	11/2013	Schofield et al.
7,926,960 B2	4/2011	Skiver et al.	8,582,052 B2	11/2013	Ockerse
7,937,667 B2	5/2011	Kramer et al.	8,884,788 B2	11/2014	McCarthy et al.
7,965,336 B2	6/2011	Bingle et al.	2001/0020202 A1	9/2001	Obradovich
7,965,357 B2	6/2011	Van De Witte et al.	2001/0026316 A1	10/2001	Senatore
7,980,711 B2	7/2011	Takayanagi et al.	2001/0035853 A1	11/2001	Hoelen et al.
7,994,471 B2	8/2011	Heslin et al.	2002/0049535 A1	4/2002	Rigo et al.
8,000,894 B2	8/2011	Taylor et al.	2002/0085155 A1	7/2002	Arikawa
8,004,768 B2	8/2011	Takayanagi et al.	2002/0092958 A1	7/2002	Lusk
8,019,505 B2	9/2011	Schofield et al.	2002/0118321 A1	8/2002	Ge
8,027,691 B2	9/2011	Bernas et al.	2002/0133144 A1	9/2002	Chan et al.
8,031,225 B2	10/2011	Watanabe et al.	2002/0149727 A1	10/2002	Wang
8,040,376 B2	10/2011	Yamada et al.	2002/0154007 A1	10/2002	Yang
8,044,776 B2	10/2011	Schofield et al.	2003/0002165 A1	1/2003	Mathias et al.
8,047,667 B2	11/2011	Weller et al.	2003/0007261 A1	1/2003	Hutzel et al.
8,049,640 B2	11/2011	Uken et al.	2003/0030724 A1	2/2003	Okamoto
8,063,753 B2	11/2011	Deline et al.	2003/0069690 A1	4/2003	Correia et al.
8,072,318 B2	12/2011	Lynam et al.	2003/0090568 A1	5/2003	Pico
8,083,386 B2	12/2011	Lynam	2003/0090569 A1	5/2003	Poechmueller
8,094,002 B2	1/2012	Schofield et al.	2003/0098908 A1	5/2003	Misaiji et al.
8,095,260 B1	1/2012	Schofield et al.	2003/0103142 A1	6/2003	Hitomi et al.
8,095,310 B2	1/2012	Taylor et al.	2003/0122929 A1	7/2003	Minaudo et al.
8,100,568 B2	1/2012	Deline et al.	2003/0133014 A1	7/2003	Mendoza
8,106,347 B2	1/2012	Drummond et al.	2003/0137586 A1	7/2003	Lewellen
8,121,787 B2	2/2012	Taylor et al.	2003/0156193 A1	8/2003	Nakamura
8,134,117 B2	3/2012	Heslin et al.	2003/0169158 A1	9/2003	Paul, Jr.
8,144,033 B2	3/2012	Chinomi et al.	2003/0179293 A1	9/2003	Oizumi
8,154,418 B2	4/2012	Hook et al.	2003/0202096 A1	10/2003	Kim
8,162,493 B2	4/2012	Skiver et al.	2003/0206256 A1	11/2003	Drain et al.
8,164,817 B2	4/2012	Varaprasad et al.	2003/0214576 A1	11/2003	Koga
8,169,307 B2	5/2012	Nakamura et al.	2003/0214584 A1	11/2003	Ross, Jr.
8,170,748 B1	5/2012	Schofield et al.	2003/0227546 A1	12/2003	Hilborn et al.
8,177,376 B2	5/2012	Weller et al.	2004/0004541 A1	1/2004	Hong
8,179,236 B2	5/2012	Weller et al.	2004/0027695 A1	2/2004	Lin
8,179,437 B2	5/2012	Schofield et al.	2004/0036768 A1	2/2004	Green
8,179,586 B2	5/2012	Schofield et al.	2004/0080404 A1	4/2004	White
8,194,132 B2	6/2012	Dayan et al.	2004/0239243 A1	12/2004	Roberts et al.
8,194,133 B2	6/2012	De Wind et al.	2004/0239849 A1	12/2004	Wang
			2005/0018738 A1	1/2005	Duan et al.
			2005/0024591 A1	2/2005	Lian et al.
			2005/0117095 A1	6/2005	Ma
			2005/0168995 A1	8/2005	Kittlemann et al.

(56)	<b>References Cited</b>			FR	1461419	12/1966
	U.S. PATENT DOCUMENTS			FR	2585991	2/1987
				FR	2672857	8/1992
				FR	2673499	9/1992
2005/0237440	A1	10/2005	Sugimura et al.	FR	2759045	8/1998
2005/0270766	A1	12/2005	Kung et al.	GB	810010	3/1959
2006/0050018	A1	3/2006	Hutzel et al.	GB	934037	8/1963
2006/0061008	A1	3/2006	Karner et al.	GB	1008411	10/1965
2006/0076860	A1	4/2006	Hoss	GB	1136134	12/1968
2006/0139953	A1	6/2006	Chou et al.	GB	1553376	9/1979
2006/0187378	A1	8/2006	Bong et al.	GB	2137573	10/1984
2006/0279522	A1	12/2006	Kurihara	GB	2161440	1/1986
2007/0064108	A1	3/2007	Haler	GB	2192370	1/1988
2007/0080585	A1	4/2007	Lyu	GB	2222991	3/1990
2007/0086097	A1	4/2007	Motomiya et al.	GB	2255539	11/1992
2007/0183037	A1	8/2007	De Boer et al.	GB	2351055	12/2000
2007/0262732	A1	11/2007	Shen	GB	2362494	11/2001
2008/0042938	A1	2/2008	Cok	JP	50-000638	1/1975
2009/0052003	A1	2/2009	Schofield et al.	JP	52-146988	11/1977
2009/0096937	A1	4/2009	Bauer et al.	JP	55-039843	3/1980
2009/0201137	A1	8/2009	Weller et al.	JP	57-30639	2/1982
2009/0258221	A1	10/2009	Diehl et al.	JP	57-208530	12/1982
2010/0245701	A1	9/2010	Sato et al.	JP	58-020954	2/1983
2010/0246017	A1	9/2010	Tonar et al.	JP	58-030729	2/1983
2010/0277786	A1	11/2010	Anderson et al.	JP	58-110334	6/1983
2011/0166779	A1	7/2011	McCarthy et al.	JP	58-180347	10/1983
2011/0273659	A1	11/2011	Sobecki	JP	58-209635	12/1983
2012/0050068	A1	3/2012	DeLine et al.	JP	59-114139	7/1984
2012/0086808	A1	4/2012	Lynam et al.	JP	60-212730	10/1985
2012/0203550	A1	8/2012	Skiver et al.	JP	60-261275	12/1985
2012/0236152	A1	9/2012	De Wind et al.	JP	61-127186	6/1986
2013/0027952	A1	1/2013	Lynam et al.	JP	61-260217	11/1986
2013/0063802	A1	3/2013	Varaprasad et al.	JP	62-043543	2/1987
2013/0107563	A1	5/2013	McCabe et al.	JP	62-075619	4/1987
2013/0153127	A1	6/2013	Schofield et al.	JP	62-122487	6/1987
2013/0229522	A1	9/2013	Schofield et al.	JP	62-131232	6/1987
2013/0289915	A1	10/2013	Blank et al.	JP	63-02753	1/1988
				JP	63-085525	4/1988
				JP	63-106730	5/1988
				JP	63-106731	5/1988
				JP	63-274286	11/1988
				JP	64-14700	1/1989
DE	941408	4/1956		JP	01-123587	5/1989
DE	944531	7/1956		JP	01-130578	5/1989
DE	7323996	11/1973		JP	02-122844	10/1990
DE	3248511	7/1984		JP	03-28947	3/1991
DE	3301945	7/1984		JP	03-052097	3/1991
DE	3605704	8/1987		JP	30-061192	3/1991
DE	3614882	11/1987		JP	03-110855	5/1991
DE	3720848	1/1989		JP	03-198026	8/1991
DE	9306989.8	7/1993		JP	03-243914	10/1991
DE	4329983	8/1995		JP	04-114587	4/1992
DE	4444443	6/1996		JP	04-245886	9/1992
DE	29703084	6/1997		JP	05-080716	4/1993
DE	29805142	5/1998		JP	05-183194	7/1993
DE	19741896	4/1999		JP	05-213113	8/1993
DE	19755008	7/1999		JP	05-257142	10/1993
DE	29902344	7/1999		JP	60-80953	3/1994
DE	19934999	2/2001		JP	61-07035	4/1994
DE	19943355	3/2001		JP	62-27318	8/1994
DE	20118868	3/2002		JP	06-318734	11/1994
DE	10131459	1/2003		JP	07-146467	6/1995
EP	0299509	1/1989		JP	07-175035	7/1995
EP	0513476	11/1992		JP	07-191311	7/1995
EP	0524766	1/1993		JP	07-266928	10/1995
EP	0729864	12/1995		JP	07-267002	10/1995
EP	0728618	8/1996		JP	07-277072	10/1995
EP	0825477	2/1998		JP	07-281150	10/1995
EP	0830985	3/1998		JP	07-281185	10/1995
EP	0928723	7/1999		JP	08-008083	1/1996
EP	937601	8/1999		JP	08-083581	3/1996
EP	0979758	2/2000		JP	08-216789	8/1996
EP	1075986	2/2001		JP	08-227769	9/1996
EP	1097848	5/2001		JP	09-033886	2/1997
EP	1152285	11/2001		JP	09-260074	3/1997
EP	1193773	3/2002		JP	05-077657	7/1997
EP	1256833	11/2002		JP	09-220976	8/1997
EP	0899157	10/2004		JP	09-230827	9/1997
EP	1315639	2/2006		JP	09-266078	10/1997
FR	1021987	2/1953				

(56)

**References Cited**

## FOREIGN PATENT DOCUMENTS

JP	09-288262	11/1997	JP	2002-072901	3/2002
JP	10-076880	3/1998	JP	2002-120649	4/2002
JP	10-190960	7/1998	JP	2002-122860	4/2002
JP	10-199480	7/1998	JP	2002-162626	6/2002
JP	10-206643	8/1998	JP	2002-352611	12/2002
JP	10-221692	8/1998	JP	2003-267129	9/2003
JP	10-239659	9/1998	JP	2004-182156	7/2004
JP	10-276298	10/1998	JP	2005-148119	6/2005
JP	11-038381	2/1999	JP	2005-327600	11/2005
JP	11-067485	3/1999	JP	38-46073	11/2006
JP	11-078693	3/1999	JP	2008-083657	4/2008
JP	11-109337	4/1999	KR	20060038856	5/2006
JP	11-131880	5/1999	KR	100663930	1/2007
JP	11-160539	6/1999	WO	WO 82/02448	7/1982
JP	11-212073	8/1999	WO	WO 86/06179	10/1986
JP	11-283759	10/1999	WO	WO 94/19212	9/1994
JP	11-298058	10/1999	WO	WO 96/21581	7/1996
JP	11-305197	11/1999	WO	WO 98/14974	4/1998
JP	2000-131681	5/2000	WO	WO 98/38547	9/1998
JP	2000-153736	6/2000	WO	WO 99/15360	4/1999
JP	2000-159014	6/2000	WO	WO 00/23826	4/2000
JP	2000-255321	9/2000	WO	WO 00/52661	9/2000
JP	2000-330107	11/2000	WO	WO 00/55685	9/2000
JP	2001-083509	3/2001	WO	WO 01/01192	1/2001
JP	2001-222005	8/2001	WO	WO 02/18174	3/2002
			WO	WO 02/49881	6/2002
			WO	WO 03/021343	3/2003
			WO	WO 03/078941	9/2003

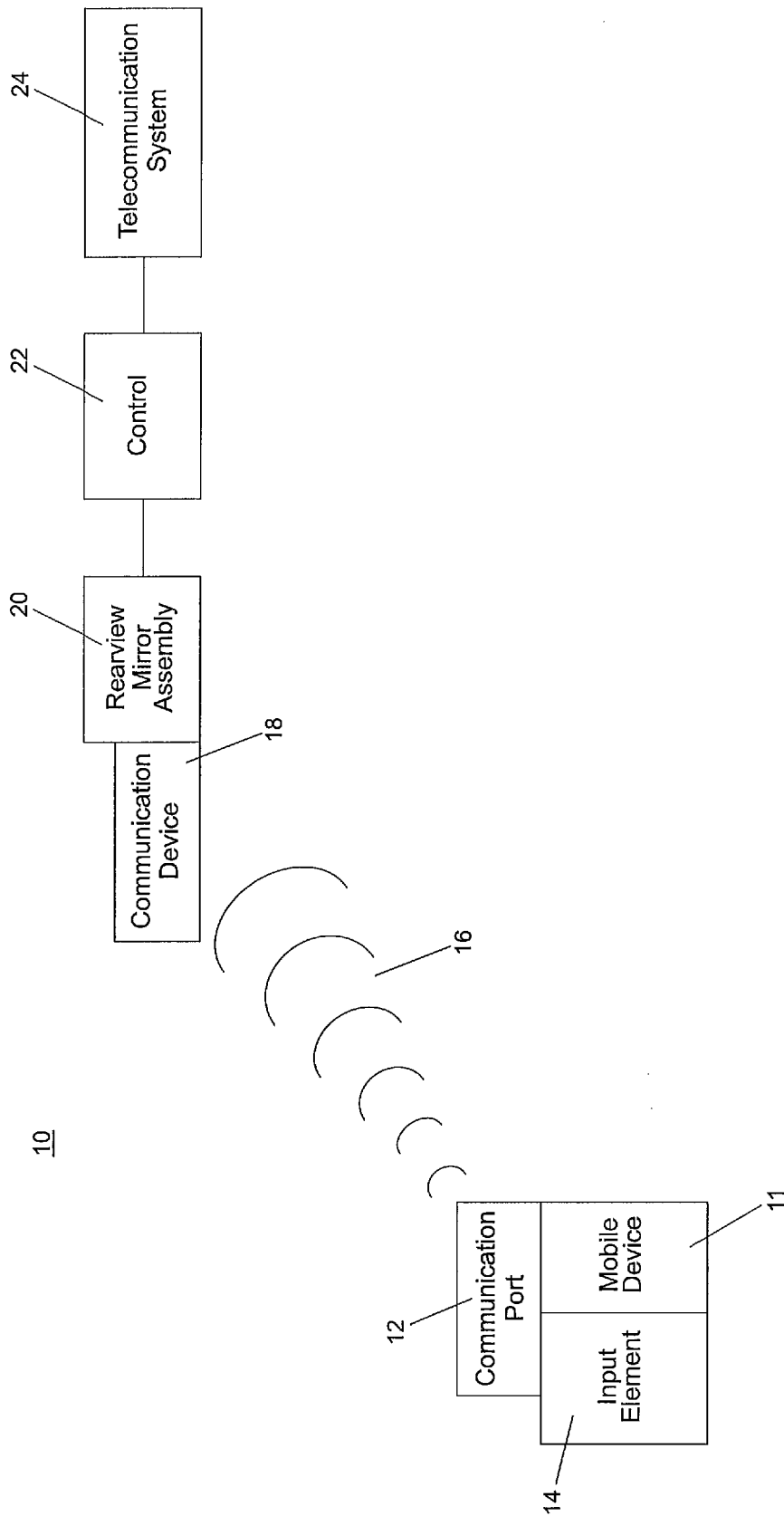
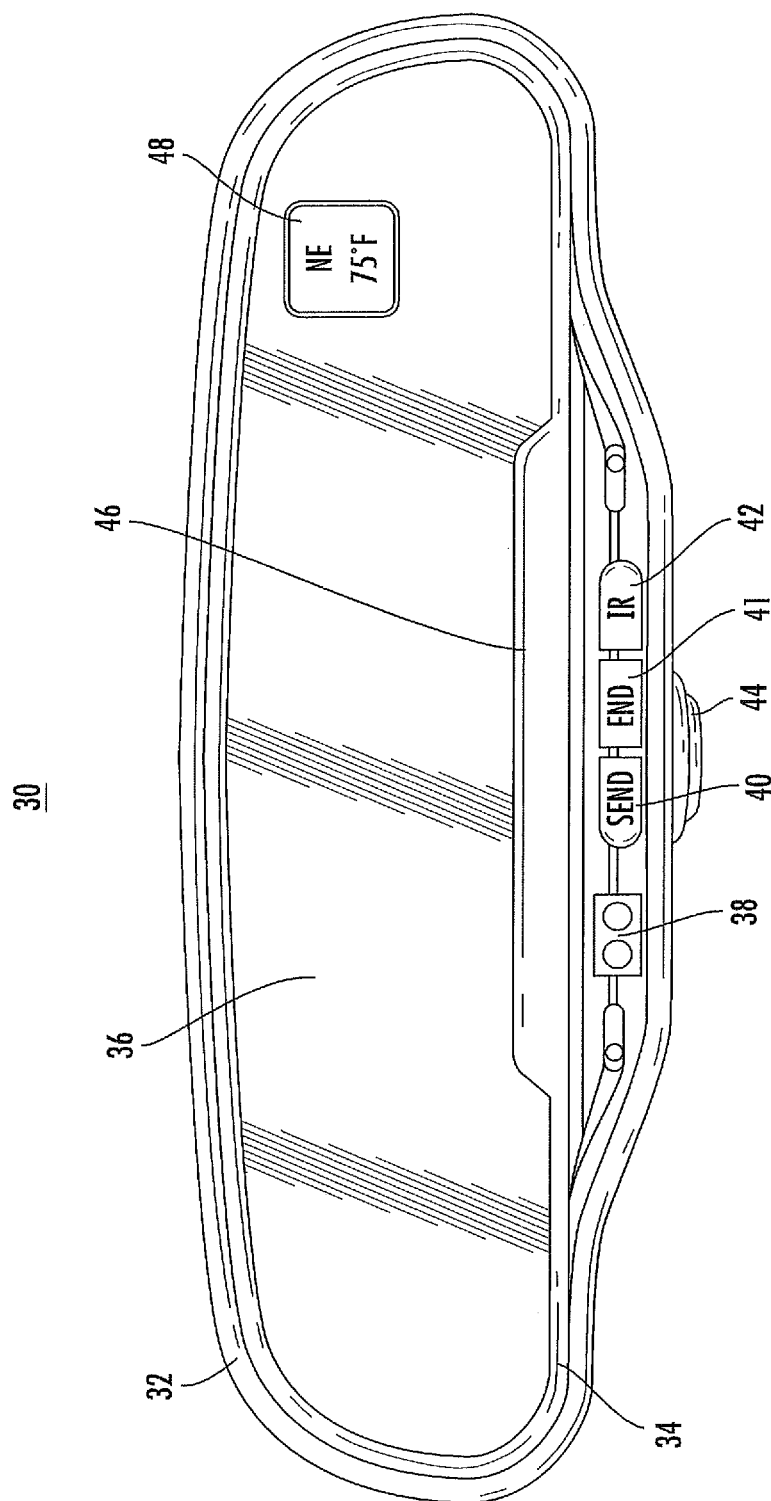


Figure 1



**FIG. 2**



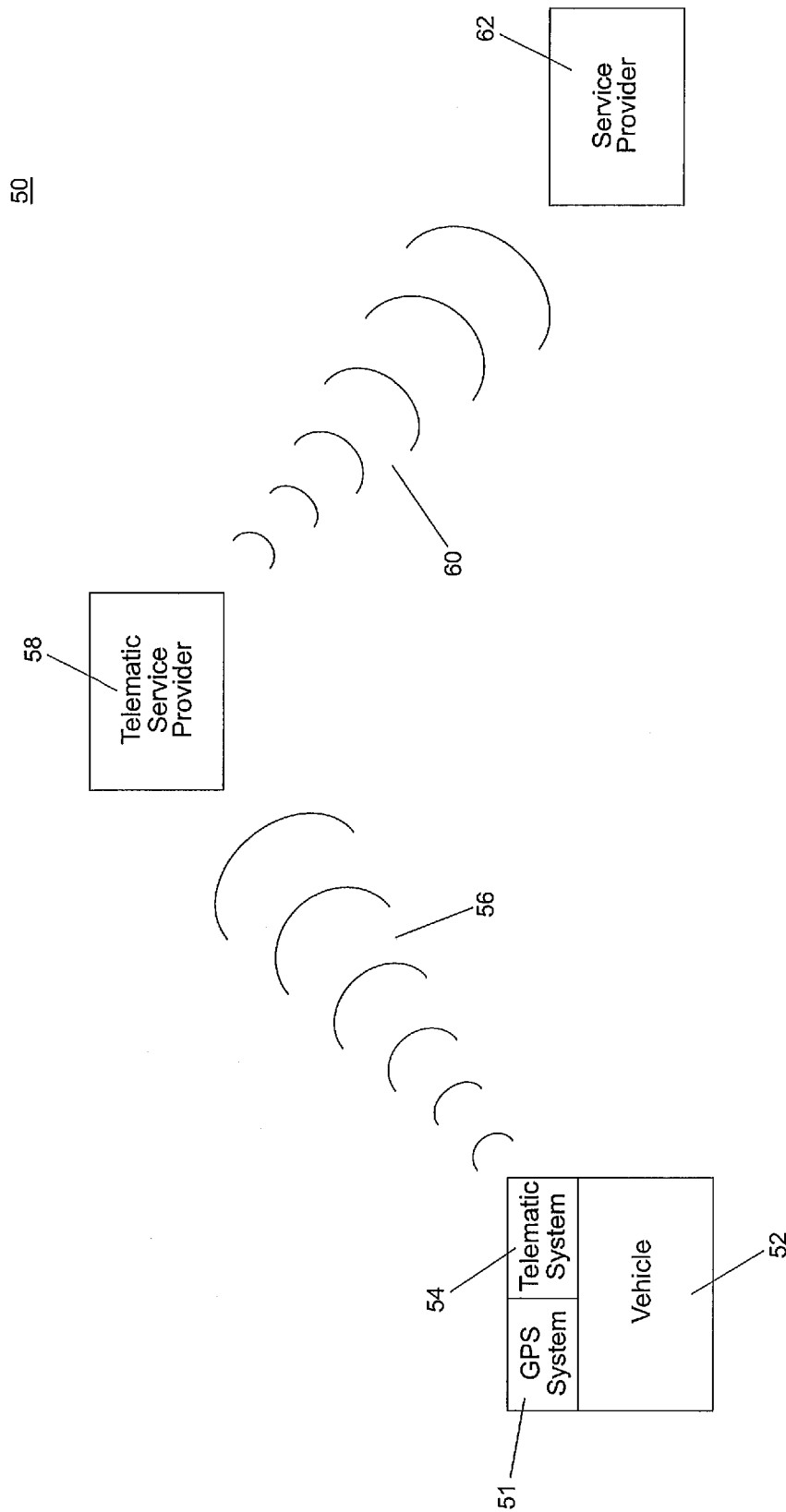


Figure 3

**AUTOMOTIVE COMMUNICATION SYSTEM****CROSS-REFERENCE TO RELATED APPLICATIONS**

This application is a continuation of U.S. patent application Ser. No. 14/015,444, filed Aug. 30, 2013, now U.S. Pat. No. 8,884,788, which is a continuation of U.S. patent application Ser. No. 13/050,133, filed Mar. 17, 2011, now U.S. Pat. No. 8,525,703, which is a continuation of U.S. patent application Ser. No. 12/551,849, filed Sep. 1, 2009, now U.S. Pat. No. 7,916,043, which is a continuation of U.S. patent application Ser. No. 11/935,795, filed Nov. 6, 2007, now U.S. Pat. No. 7,583,204, which is a continuation of U.S. patent application Ser. No. 11/053,436, filed on Feb. 8, 2005, now U.S. Pat. No. 7,382,289, which is a continuation of U.S. patent application Ser. No. 10/777,812, filed on Feb. 12, 2004, now U.S. Pat. No. 6,909,361, which is a continuation of U.S. patent application Ser. No. 09/839,678, filed on Apr. 20, 2001, now U.S. Pat. No. 6,693,517, which claims priority from U.S. provisional application Ser. No. 60/199,676, filed on Apr. 21, 2000, the disclosures of which are hereby incorporated herein by reference in their entirety; and application Ser. No. 10/777,812 is a continuation-in-part of U.S. patent application Ser. No. 10/365,794, filed on Feb. 13, 2003, now U.S. Pat. No. 6,832,719, which is a continuation of U.S. patent application Ser. No. 09/687,778, filed Oct. 13, 2000, now U.S. Pat. No. 6,547,133, which is a continuation of U.S. patent application Ser. No. 09/057,428, filed Apr. 8, 1998, now U.S. Pat. No. 6,158,655; and application Ser. No. 10/777,812 is a continuation-in-part of U.S. patent application Ser. No. 10/755,627, filed on Jan. 12, 2004, now U.S. Pat. No. 7,158,881, which is a continuation of U.S. patent application Ser. No. 10/287,178, filed on Nov. 4, 2002, now U.S. Pat. No. 6,678,614, which is a continuation of U.S. patent application Ser. No. 09/799,414, filed on Mar. 5, 2001, now U.S. Pat. No. 6,477,464, which claims priority from U.S. provisional patent application Ser. No. 60/187,960, filed on Mar. 9, 2000; and U.S. patent application Ser. No. 13/050,133 is a continuation-in-part of U.S. patent application Ser. No. 12/536,930, filed Aug. 6, 2009, now U.S. Pat. No. 8,044,776, which is a continuation of U.S. patent application Ser. No. 12/052,341, filed Mar. 20, 2008, now U.S. Pat. No. 7,579,940, which is a continuation of U.S. patent application Ser. No. 11/625,374, filed Jan. 22, 2007, now U.S. Pat. No. 7,579,939, which is a continuation of U.S. patent application Ser. No. 10/755,915, filed Jan. 13, 2004, now U.S. Pat. No. 7,446,650, which is a continuation of U.S. application Ser. No. 09/793,002, filed Feb. 26, 2001, now U.S. Pat. No. 6,690,268, which claims benefit of U.S. provisional applications, Ser. No. 60/263,680, filed Jan. 23, 2001; Ser. No. 60/243,986, filed Oct. 27, 2000; Ser. No. 60/238,483, filed Oct. 6, 2000; Ser. No. 60/237,077, filed Sep. 30, 2000; Ser. No. 60/234,412, filed Sep. 21, 2000; Ser. No. 60/218,336, filed Jul. 14, 2000; and Ser. No. 60/186,520, filed Mar. 2, 2000.

**BACKGROUND OF THE INVENTION**

This invention relates to data and information communication within an automobile and particularly to automotive mirror assemblies adapted to communicate wirelessly with other vehicular accessories and/or with personal accessories of occupants of the vehicle.

**SUMMARY OF THE INVENTION**

A vehicle may have features and/or accessories connected by a variety of wireless links and/or wired links, such as are

described in commonly assigned U.S. Pat. No. 6,396,408, which claims priority from U.S. provisional patent application Ser. No. 60/196,577, filed on Mar. 31, 2000, and U.S. Pat. No. 6,294,989, the disclosures of which are hereby incorporated herein by reference. For example, some vehicle features, accessories and functions can be interconnected by and/or can communicate by wire connection, by wireless infrared communication, wireless microwave communication, by wireless RF communication, or by any combination of the above.

As described also in commonly assigned U.S. Pat. No. 6,690,268, which relates to U.S. provisional application Ser. No. 60/263,680, filed on Jan. 23, 2001, U.S. provisional application Ser. No. 60/243,986, filed on Oct. 27, 2000, U.S. provisional application Ser. No. 60/238,483, filed on Oct. 6, 2000, U.S. provisional application Ser. No. 60/237,077, filed on Sep. 30, 2000, U.S. provisional application Ser. No. 60/234,412, filed on Sep. 21, 2000, U.S. provisional application Ser. No. 60/218,336, filed on Jul. 14, 2000, and U.S. provisional patent application Ser. No. 60/186,520, filed on Mar. 2, 2000, and in commonly assigned U.S. Pat. Nos. 6,000,823 and 5,959,367, all of the disclosures of which are hereby incorporated herein by reference, the vehicle and particularly the interior/exterior mirror assembly can host a variety of features and accessories. Also, such features and accessories can be connected via cable elements, such as coaxial cable, a multi-ribbon cable, a multiwire cable, and/or a fiber-optic cable (for communicating by optical method), or can be connected without wires, such as by short range RF wireless communication such as provided by Motorola, Schaumburg, Ill. via their BLUETOOTH protocol or by infrared wireless communication such as provided via the IrDA protocol available from Clarinet System Inc. of San Jose, Calif.

The present invention is particularly suitable for use in a "connected car," i.e., an automobile in two-way communication with a remote party such as by a telematic wireless communication link, and most preferably, connected to an information source such as the WorldWide WEB via the INTERNET. This present invention provides compatibility and interoperability for mobile devices, such as hand-held mobile phones, personal digital assistants (PDA) such as a PalmPilot PDA, hand-held personal identifiers, hand-held remote entry devices, such as a key fob as known in the automotive arts including active and passive entry key fobs, and the like.

Accessories may be provided at the purchase of the vehicle as in-vehicle installed items or may be carried in and out of the vehicle by the user. Such can be provided with ports or interfaces adapted to communicate via the use of a cable or wired communication, but more preferably a wireless communication. For example, a modular phone may be equipped with an RF communication link operating under a short-range wireless communication protocol, such as BLUETOOTH available from Motorola of Schaumburg, Ill., that communicates with the vehicle wirelessly so that, for example, telephone communication can be conducted via the audio system of the vehicle while the occupant possessing the BLUETOOTH-equipped phone is using the phone. Likewise, a phone or other mobile device can be equipped with an infrared (IR) communication interface/port such as an IrDA port than can provide wireless infrared connectivity.

A vehicle mirror-based wireless communication system, according to an aspect of the invention, includes an interior rearview mirror assembly including an interior mirror reflective element, a housing for the reflective element, and a mirror-mounted communication device. The mirror-mounted communication device includes a communication data port

for short-range communication with a mobile device that is a personal accessory of an occupant of the vehicle. The communication device further includes a telecommunication link from the vehicle to an external provider of information or service. In this manner, the communication device provides connectivity between a low-power mobile device and a provider of information or service separated from the vehicle.

A vehicle mirror-based wireless communication system, according to another aspect of the invention, includes an interior rearview mirror assembly including an interior mirror reflective element and a housing for the reflective element. A remote telematic server is provided that is remote from the vehicle. A vehicular dynamic interactive communication system is provided at the rearview mirror assembly. The communication system includes a Global Positioning System (GPS) for determining a geographic location of the vehicle and a first communication link with the remote telematic server. The mirror-based wireless communication system further includes at least one service provider and a second communication link between the at least one service provider and the telematic server. In this manner, the communication system communicates identification data to the telematic server pertaining to either the location, identity and/or direction heading of the vehicle. The at least one service provider provides assistance data to the vehicle via the first and second communication links. The assistance data is customized to the location identity and/or direction heading of the vehicle.

These and other objects, advantages and features of this invention will become apparent upon review of the following specification in conjunction with the drawings.

#### BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is an electrical block diagram of a vehicle mirror-based wireless communication system, according to the invention;

FIG. 2 is a front elevation of an interior rearview mirror assembly, according to the invention; and

FIG. 3 is an electronic block diagram of a vehicle mirror-based wireless communication system, according to another aspect of the invention.

#### DESCRIPTION OF THE PREFERRED EMBODIMENT

In order for mobile devices to be used within the interior cabin of a vehicle, such as an automobile, the vehicle must be equipped with at least one complementary interface/port capable of wireless communication with the mobile device within the vehicle cabin, or when approaching the vehicle from the exterior. Where wireless infrared connectivity is used, it is preferred that line-of-sight communication be possible between the mobile device and the interface/port of the vehicle that serves as the interface and exchange point for data between the mobile device and the vehicle electronics system/accessories. In this regard, placement of an IR data port at the interior rearview mirror assembly (such as at or in the case/bezel of the assembly, or attached to the mirror assembly support about which the casing housing is adjustable, or at or in a pod attached to the attachment mount of the interior mirror assembly to the vehicle, such as to a mirror mounting button on a windshield as are known in the mirror arts) has the advantage of being high mounted and central, and so accessible to all vehicle occupants including those in both the front seats and in rear seats.

The interior rearview mirror of the vehicle (and optionally an exterior side view mirror of the vehicle) is preferably

equipped with at least one infrared communication port such as an IrDA (Infrared Data Port) such as the devices available from by Clarinet Systems Inc., San Jose, Calif. for wireless connectivity to other IrDA devices such as the Personal Digital Assistants (PDA) like the Palm Pilot Palm III, IIIx, V, VII, Glenarye pager, Motorola 2000X Pagewriter, and similar devices and cellular phones equipped with IrDA ports such as the Nokia 6210, Windows CE devices, laptop computers, and similar mobile devices having wireless communication capabilities to paging, cellular, or satellite systems. Also, by connecting a mobile device to the vehicle via a vehicle-mounted, preferably mirror-mounted, wireless connectivity interface/port, a low-feature and/or low-power mobile device can be linked to the vehicle, and the vehicle (including its on-board computer) can serve as the modem/communication port/computer for the mobile device, thus greatly expanding the capability of the mobile device. This enables wireless connectivity of devices that originally could not act as a wireless modem.

Also, mobile devices typically have restricted display capabilities. By connecting wirelessly to the vehicle and to the vehicle's electronics (such as a vehicle computer), the greater display capability and/or greater computing power of the vehicle (such as a vehicle video display, preferably mirror-mounted, such as disclosed in commonly assigned U.S. Pat. No. 6,690,268, which relates to U.S. provisional application Ser. No. 60/263,680, filed on Jan. 23, 2001, U.S. provisional application Ser. No. 60/243,986, filed on Oct. 27, 2000, U.S. provisional application Ser. No. 60/238,483, filed on Oct. 6, 2000, U.S. provisional application Ser. No. 60/237,077, filed on Sep. 30, 2000, U.S. provisional application Ser. No. 60/234,412, filed on Sep. 21, 2000, U.S. provisional application Ser. No. 60/218,336, filed on Jul. 14, 2000, and U.S. provisional patent application Ser. No. 60/186,520, filed Mar. 2, 2000, the disclosures of which are hereby incorporated herein by reference), can be accessed and used by the mobile device.

A separate display is located behind the mirror reflector. In such a configuration where a display element is behind the mirror reflector, the reflective mirror coating of the mirror reflective element can be locally at least partially removed at the location of the display element disposed behind the mirror element. Optionally, where all the reflective mirror coating is removed, a semitransparent but significantly reflecting coating or series of coatings (such as a thin metal film coating or a multilayer of coatings, including a thin metal coating of silver, aluminum, rhodium (or their alloys), or the like, or a dichroic coating or coating stack, can be used that substantially masks the display element from driver notice until the display element is powered to display information, such as disclosed in U.S. Pat. Nos. 5,668,663 and 5,724,187, which are incorporated by reference in their entireties. Such has been described as "display on demand" in the art. Such display can include a "display on demand" such as disclosed in U.S. Pat. Nos. 5,668,663 and 5,724,187 noted above. In this regard, it is preferable that the display be a light-emitting display, such as a fluorescent display, a vacuum fluorescent display, a field emission display, an electroluminescent display, a fluorescent display, a plasma display, or a light-emitting diode display, such as an organic or inorganic light-emitting diode display. Alternatively, the reflective element may comprise a substantially reflecting, significantly light-transmitting reflective element, such as disclosed in U.S. Pat. Nos. 5,668,663 and 5,724,187 noted above. An example, such as a semitransparent reflector, would be a third surface reflector coated on the third surface of an electrochromic mirror element, as known in the electrochromic mirror art, consisting of a thin metal coating (such as of silver, silver alloy,

aluminum, aluminum alloy) that is significantly reflecting of at least 60%, preferably at least 70% and most preferably at least 75% but also significantly transmitting in the range of between 5% to 30%, preferably in the range of between 10% and 25% and most preferably in the range of between 15% and 20%. Preferably, the thin metal coating is overcoated with a transparent conductor such as indium tin oxide when contacting an electrochromic medium (preferably an electrochromic solid polymer film) when serving as a combined third surface reflector/conductor layer in an electrochromic laminate cell construction. For further details of suitable reflective elements with portions of the reflective mirror coating adapted to permit light to transmit through the reflective element or of a highly reflecting/significantly transreflective reflective element, reference is made to U.S. Pat. Nos. 5,668, 663 and 5,724,187.

This access can be facilitated via protocols such as the Wireless Application Protocol (WAP) for mobile devices and can be networked via sub-networks of the World Wide Web by systems providers such as JP Systems Inc. of Dallas, Tex. Such networks are designed for mobile devices and include client applications, gateways, and backend servers integrating with open standards, such as WAP. The server compresses and optimizes data so that it can be sent to wireless devices in a format that is best suited to those devices. Typically this data is displayed in a few lines of text, preferably a scrolling line of text data, to suit such mobile interactive transceivers. When connected within a vehicle, preferably such data is displayed at the interior rearview mirror.

As described in commonly assigned U.S. Pat. No. 6,477, 464, which claims priority from U.S. provisional patent application Ser. No. 60/187,960 filed on Mar. 9, 2000, and U.S. Pat. No. 6,553,308, which claims priority from U.S. provisional application Ser. No. 60/131,593 filed on Apr. 29, 1999, the disclosures of which are hereby incorporated herein by reference, provision of a display and particularly a scrolling text display at the interior rear view assembly of the vehicle (and/or the exterior rear view mirror assembly) has many advantages including ease of readability and recognition by the driver of the vehicle.

The interfacing of a mobile accessory to the vehicle via a wireless link, preferably a wireless IR link, can be further enhanced by linking to the vehicle's GPS system. The GPS system can provide location/directional information to the driver. This can facilitate a PUSH communication protocol whereby information and messages are automatically transmitted to the driver. Alternatively, or in addition, a PULL communication protocol can be used whereby the driver selects information at his/her request only. This optionally can be a user-defined option. For example, assume the vehicle equipped with the present invention is approaching a service/convenience/food supplier such as a Starbucks coffee location or a service station. The in-vehicle GPS system can alert the WAP hardware located either in the vehicle or, through the IrDA port, on the handheld device and offer a discount such as a \$0.25 electronic coupon if the driver decides to stop for a particular purchase at that store. The vehicle location is wirelessly transmitted from the vehicle to a system such as ONSTAR™ available from General Motors or a similar system. The location of the vehicle is then provided to a service location proximate to the location of the vehicle or in the direction of travel of the vehicle. Such service provider(s) can then communicate wirelessly back to the vehicle specific information/service offers/discount information/advertisements, and the driver or other occupants of the vehicle can make decisions based on this received information and/or can specifically communicate with such service provider(s).

Also, INTERNET and/or telemetry sites and services can be provided at a low cost or free to the driver, and with the compensation to the remote service provider be via advertisements received at the vehicle and displayed to the driver. By linking via the GPS system of the vehicle, such advertisements can be customized to suit the particular geographic location where the vehicle is located. Also, customized entertainment and/or information can be provided by wireless communication to the vehicle, such as from a digital satellite radio station, and with content, such as advertisements, local news broadcasts, weather data, traffic data, and the like, customized to the particular location of the vehicle via dynamic interactive communication that communicates GPS data concerning the vehicle location and heading, generated by an in-vehicle GPS system, from the vehicle to a remote receiver (such as a web site, telemetry service or media station) via wireless transmission and receiving of data to and from the vehicle, and, preferably, via an IrDA-port, to a mobile device such as a personal cell phone or PDA in the vehicle.

Another embodiment of the invention is the placement of mobile device communication ports such IrDA ports in the vehicle cabins of automobiles in a rental car fleet. Preferably, the communication port, such as an IrDA port, is placed at the interior rearview mirror assembly, as this is a central location that is readily accessed by a variety of drivers, many of who will be new to the type of rented model, but who will have had previous familiarity with accessing a mirror-mounted IrDA port. This would enable the temporary user of the vehicle access mobile communication and services as well as communication to the rental company if the vehicle breaks down or requires servicing. Certain vehicles could also be equipped with faxes and keyboards for a mobile office capable of sending and receiving information.

In addition to these features, the IrDA port can serve as the interface to systems within the mirror such as a palm-sized keyboard similar to a handheld PDA where the operator can compose, edit, and access systems located in the mirror. This system can be available as an option because, due to the open architecture of the IrDA port, the operator can also interface the system with the existing PDA, phone, or other mobile device capable of composing or editing messages. This provides a useful interface for the operator for entering street addresses and E-mail messages.

In addition, the interior rearview mirror assembly can aid in the interfacing of the mobile communication protocol/needs of a particular brand/model of mobile device (such as, for example, a Palm Pilot™ PDA) to a particular vehicle model of a car manufacturer. For example, the vehicle bus system for a GM vehicle may be different than the architecture for a Ford vehicle. The interior mirror assembly in the respective model/brand of vehicle can function to allow the PalmPilot™, for example, owned by a person to interact with whatever automobile that person carries that PalmPilot™ into, whether a GM vehicle, a Ford vehicle or any other vehicle equipped with a mirror-mounted IrDA-port.

FIG. 1 illustrates an embodiment of the present invention. Mirror-mounted wireless communication system 10 includes a mobile device 11 equipped with a mobile device communication port 12 (preferably an IrDA-port that transmits/receives data via infrared wireless communication). When data is input to mobile device 11 via input element 14 (which may be a keypad or a touch or stylus actuated screen), a communication signal 16 is wirelessly transmitted to mirror-mounted communication device 18 mounted at interior rearview mirror assembly 20 that is located within the interior cabin of a vehicle (not shown). Preferably, interior mirror assembly 20 is in electronic/data communication with the

vehicle electronic system/accessories schematically represented by control **22** in FIG. **1**. Control **22** links to vehicle-based telecommunication system **24** that provides a wireless telecommunication link from the vehicle to an external service/information provider.

Also, the mobile device may wirelessly communicate with the vehicle when the driver is approaching the vehicle when parked, such as to provide identity to the vehicle in order to activate/deactivate a security system, an entry system such as door locks, and the like. Also, the mobile device can take part in vehicle-based remote transactions, such as purchases, banking transactions, and the like, such as are described in commonly assigned U.S. Pat. No. 6,158,655, the disclosure of which is hereby incorporated herein by reference. The mobile device, such as a PDA, may include driver license, insurance, registration and similar data that can be displayed to the like of a police officer using a vehicle-based video screen. The vehicle can have built-in codes that authorize use of the vehicle by particular drivers/owners of particular mobile devices.

An interior rearview mirror system **30** incorporating the present invention is shown in FIG. **2**. Interior rearview mirror assembly **32** includes a mirror reflector element **36** that is within mirror casing **34**. Reflector element **36** may be a prismatic mirror element or an electrically variable reflectance element such as an electro-optic reflective element such as an electrochromic reflective element such as described in commonly assigned U.S. Pat. Nos. 5,140,455; 5,151,816; 5,567,360; 5,525,264; 5,610,756; 5,406,414; 5,253,109; 5,076,673; 5,073,012 or 5,117,346, which are hereby incorporated herein by reference, and in publications: N. R. Lynam, "Electrochromic Automotive Day/Night Mirrors", SAE Technical Paper Series 870636 (1987); N. R. Lynam, "Smart Windows for Automobiles", SAE Technical Paper Series 900419 (1990); N. R. Lynam and A. Agrawal, "Automotive Applications of Chromogenic Materials", Large Area Chromogenics: Materials and Devices for Transmittance Control, C. M. Lampert and C. G. Granquist, EDS., Optical Engineering Press, Washington (1990), the disclosures of which are hereby incorporated by reference herein in their entireties.

A communication transmitting and/or receiving data port **38** is located in the front, lower bezel portion of casing **34**, below mirror reflector element **36**. When mirror system **30** is mounted in a vehicle (such as attached to a vehicle windshield or to a vehicle header, as is known in the mirror art), communication port **38** is adapted to receive data from and/or transmit data to a mobile device (such as a PDA or a cellular phone) by wireless data communication. Preferably, communication port **38** comprises an IR data port. Manually operated controls, **40**, **41** and **42**, facilitate exchange of data between mirror system **30** and a mobile device. Mirror system **30** also includes a multi-text display **46**, that preferably comprises a multi-pixel display, more preferably a reconfigurable display and most preferably a display capable of scrolling, such as described in commonly assigned U.S. Pat. No. 6,477,464, which claims priority from U.S. provisional application Ser. No. 60/187,960 filed on Mar. 9, 2000, and U.S. patent application Ser. No. 09/817,874, filed on Mar. 26, 2001, now U.S. Pat. No. 7,224,324, which claims priority from U.S. provisional application Ser. No. 60/192,721, filed on Mar. 27, 2000, the disclosures of which are hereby incorporated herein by reference. Mirror system **30** also includes a display of compass direction and external or interior vehicular temperature.

Also, a mobile device in data communication with mirror system **30** can optionally attach to or dock with the interior mirror assembly, and/or can form a pendant accessory

thereto, such as is described in commonly assigned U.S. Pat. No. 6,428,172, the disclosure of which is hereby incorporated herein by reference.

Also, the mobile device can link to a vehicle bus system, such as a CAN or LIN system such as disclosed in commonly assigned U.S. Pat. No. 6,396,408, which claims priority from U.S. provisional patent application Ser. No. 60/196,577, filed on Mar. 31, 2000, the disclosures of which are hereby incorporated herein by reference, via data communication with communication port **38** of mirror system **30**.

A vehicular dynamic interactive communication system **50** is shown in FIG. **3**. Vehicle **52** includes an in-vehicle GPS system **51** that receives GPS information from a satellite system (not shown) that identifies the geographic location of the vehicle, and its direction while travelling on a highway. This data and other information, such as vehicle type, driver personal information, and the like, is processed by in-vehicle telematic system **54**, which communicates via two-way wireless link **56** with a remote telematic service provider **58** (such as an ONSTAR™ system or a dial-in computer server or the like). Telematic service provider **58**, upon identifying the location, identity and direction heading of vehicle **52**, conveys this data via two-way communication link **60** (also, preferably, a wireless link) to a service provider **62** (such as a gas station, store, cinema, WEB site, toll center, banking center, satellite radio provider, and the like). Service provider **62**, upon receipt of input data from vehicle **52** via link **60**, provides data/information/service back to vehicle **52** via telematic service provider **58**, and preferably with this data/information/service customized to the geographic location and heading of vehicle **52** as generated by GPS system **51**.

Also, many mobile devices such as PDAs, cellular phones, and the like, require manual input of data. However, while driving in a car, this may be impractical and/or unsafe for the driver. By linking such mobile devices to a vehicle, as disclosed in the present invention, an in-vehicle voice detection/voice recognition/voice generation system, such as are described in commonly assigned U.S. Pat. No. 6,428,172 and U.S. Pat. No. 6,420,975, the disclosures of which are hereby incorporated herein by reference, can be used to operate the mobile device while traveling in the vehicle. For example, by using an in-vehicle voice detection/recognition/generation system, and by linking a PDA to the vehicle as disclosed in the present invention, the driver can hear data stored in the PDA (such as calendar information, notes and the like) by playback via the vehicle audio system (and with the vehicle voice generation system receiving digital data stored in the PDA via wireless, or less desirably wired, link of the PDA to the vehicle and then converting this digital data to a simulated voice that reads the digital data to the driver via the vehicle audio system). Likewise, the in-vehicle voice detection/recognition/generation system can receive spoken words from the driver, convert these to digital data, and communicate this to the PDA.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. An automotive communication system for a vehicle, said automotive communication system comprising:

- a global positioning system operable to determine a geographical location;
- a multi-pixel reconfigurable display device disposed at an interior portion of a vehicle equipped with said automotive communication system;

wherein data is wirelessly communicated to and is received by electronic circuitry of the equipped vehicle and wherein said data is at least in part customized to the

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geographic location of the equipped vehicle as determined by said global positioning system;  
 wherein information derived at least in part from said data is displayed by said display device and is viewable by a driver of the equipped vehicle who is operating the equipped vehicle;  
 wherein a user input for the wireless communication is operable within an interior cabin of the equipped vehicle;  
 wherein said automotive communication system includes voice input and said automotive communication system includes voice generation; and  
 wherein said data is wirelessly communicated to the equipped vehicle from a data provider located external of and remote from the equipped vehicle.

2. The automotive communication system of claim 1, wherein said data is wirelessly communicated via at least one of a PUSH communication protocol and a PULL communication.

3. The automotive communication system of claim 2, wherein said data provider comprises a telematics provider.

4. The automotive communication system of claim 1, wherein said automotive communication system comprises a link to a vehicle bus system.

5. The automotive communication system of claim 1, wherein said user input comprises at least one of a key input and a touch input.

6. The automotive communication system of claim 1, wherein said automotive communication system comprises a wireless link with a mobile accessory that is a personal accessory of an occupant of the equipped vehicle.

7. The automotive communication system of claim 6, wherein said data is associated with a web site.

8. The automotive communication system of claim 6, wherein said mobile accessory comprises a hand-held telephone.

9. The automotive communication system of claim 1, wherein said display device is disposed in the interior of the equipped vehicle at an interior mirror assembly of the equipped vehicle and wherein said user input is located at said interior mirror assembly.

10. The automotive communication system of claim 1, wherein said automotive communication system comprises a BLUETOOTH protocol and wherein said data is wirelessly communicated via at least one of a PUSH communication protocol and a PULL communication.

11. An automotive communication system for a vehicle, said automotive communication system comprising:  
 a global positioning system operable to determine a geographical location;  
 a multi-pixel reconfigurable display device disposed at an interior portion of a vehicle equipped with said automotive communication system;  
 wherein data is wirelessly communicated to and is received by electronic circuitry of the equipped vehicle and wherein said data is at least in part customized to the geographic location of the equipped vehicle as determined by said global positioning system;  
 wherein information derived at least in part from said data is displayed by said display device and is viewable by a driver of the equipped vehicle who is operating the equipped vehicle;  
 wherein said automotive communication system includes voice input;

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wherein said data is wirelessly communicated to the equipped vehicle from a data provider located external of and remote from the equipped vehicle;  
 wherein said automotive communication system comprises a wireless link with a mobile accessory that is a personal accessory of an occupant of the equipped vehicle;  
 wherein said mobile accessory comprises a hand-held telephone; and  
 wherein said data is associated with a web site.

12. The automotive communication system of claim 11, wherein said user input comprises a touch input.

13. The automotive communication system of claim 12, wherein said automotive communication system comprises a BLUETOOTH protocol.

14. The automotive communication system of claim 13, wherein said automotive communication system includes voice generation.

15. The automotive communication system of claim 14, wherein a user input for the wireless communication is operable within an interior cabin of the equipped vehicle.

16. An automotive communication system for a vehicle, said automotive communication system comprising:  
 a global positioning system operable to determine a geographical location;  
 a multi-pixel reconfigurable display device disposed at an interior portion of a vehicle equipped with said automotive communication system;  
 wherein data is wirelessly communicated to and is received by electronic circuitry of the equipped vehicle and wherein said data is at least in part customized to the geographic location of the equipped vehicle as determined by said global positioning system;  
 wherein information derived at least in part from said data is displayed by said display device and is viewable by a driver of the equipped vehicle who is operating the equipped vehicle;  
 wherein said automotive communication system includes voice input;  
 wherein said data is wirelessly communicated to the equipped vehicle from a data provider located external of and remote from the equipped vehicle;  
 wherein said automotive communication system comprises a wireless link with a mobile accessory that is a personal accessory of an occupant of the equipped vehicle;  
 wherein said data provider comprises a telematics provider; and  
 wherein said data is associated with at least one of a gas station, a store, a cinema, and a web site.

17. The automotive communication system of claim 16, wherein said mobile accessory comprises a hand-held telephone.

18. The automotive communication system of claim 17, wherein said automotive communication system comprises a BLUETOOTH protocol.

19. The automotive communication system of claim 18, wherein said automotive communication system includes voice generation.

20. The automotive communication system of claim 17, wherein a user input for the wireless communication is operable within an interior cabin of the equipped vehicle and wherein said data is wirelessly communicated via at least one of a PUSH communication protocol and a PULL communication.